

AI AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
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ENGINEERING • PRODUCTION • MANAGEMENT

APRIL 1, 1951

In This Issue . . .

Army Transport Problems in Korea

Oldsmobile Super 88 Features

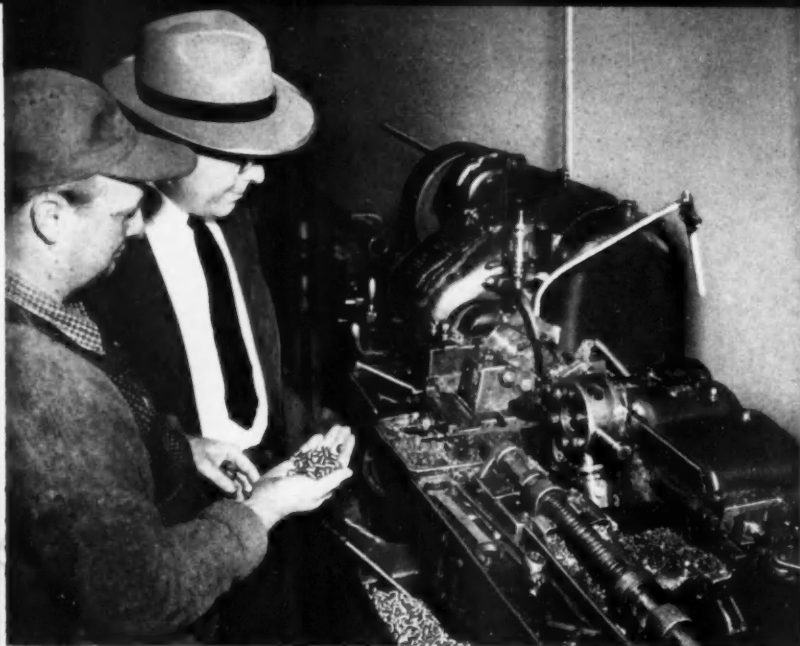
Catbeira Twin-Jet Bomber Design

Chrysler Torque Converter Production

Extruded Hollow Propeller Blades

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A C H I L T O N P U B L I C A T I O N



What's YOUR problem?



R. L. Hansen of Green Bay, Wisconsin, is the Standard Oil lubrication specialist who recommended STANICUT and solved the cutting-oil problems of this machine job shop.

He and other lubrication specialists are located throughout the Midwest. They are ready to give you prompt and expert attention. If you have a lubrication problem, the lubrication specialist nearest your plant is the man to see.

He has been specially trained for his counseling job in a Standard Oil Lubrication Engineering School. In addition, plenty of practical experience qualifies him to give thorough and reliable service.

A phone call or post card to the nearest Standard Oil Company (Indiana) office will obtain a lubrication specialist's services for you. When he calls, ask him to discuss with you the performance records of the following fine products:

STANICOOL HD Soluble Oil—Because it contains additional compounding, this soluble oil possesses not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds—Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical application. STANOSTAMPS offer maximum protection for dies and work. These compounds can be readily removed in conventional washing equipment.

Why use two when one will do?

THERE one cutting oil that can handle the wide variety of jobs performed in automatic screw machines—give good tool life on steels and achieve fine finishes on brass and aluminum?"

This question was asked by the operators of a midwest machine job shop. The Standard Oil lubrication specialist whom they consulted recommended STANICUT Cutting Oil 137BCS.

In the performance of this versatile cutting oil, the operators found the answer to their problem. STANICUT has been used with equal success on all of the jobs in the shop.

Compared with cutting fluids previously tried, it has given 50% longer tool life. Production has been maintained at a high level. This is indicated in the threading of $\frac{3}{8}$ " steel stock, where STANICUT permits top cutting speeds. On brass and aluminum,

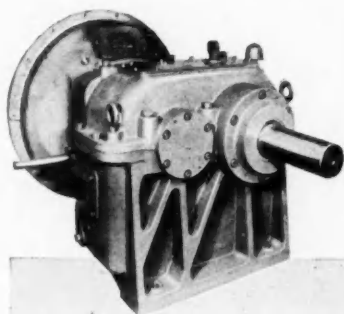


STANICUT provides the satisfactory finish desired.

This company learned from practical experience the advantages of STANICUT Cutting Oil. A consultation with a Standard Oil lubrication specialist may result in savings on a wide variety of operations and may mean more efficient production for your plant. A Standard Oil lubrication specialist is within easy reach of your company. Write Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago 80, Illinois.

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...Cotta Reduction Gear, original equipment on Model 2400 Lima Shovel



Modern, high-speed engines have presented problems to many users and manufacturers of heavy-duty equipment. Cotta has the answer! For cranes, drillers, locomotives, shovels, generators, pumps, etc., Cotta Reduction Units are designed to modify output speed of new engines to meet requirements of such equipment. In these days, particularly, when

new equipment will be hard to get...when old equipment must be rebuilt...when new designs are delayed due to demands of the defense effort... "Come to Cotta" for speed reduction and power transmission units. Reduction Gears are available in a broad range of ratios, with input torque from 150 to 2,000 foot pounds.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

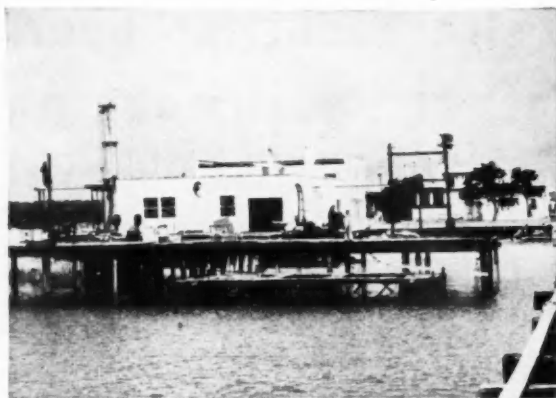
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA

**HEAVY-DUTY
REDUCTION UNITS**

"Engineered-to-order"



View of Harbor Island Laboratory and Testing Station.

New testing station provides expanded facilities for corrosion studies

During the past 15 years, the Atlantic Ocean at Kure Beach served as a giant test tube for studying attacks of sea water and salt air upon more than 35,000 specimens, including virtually all types of metals and alloys.

Storm damage to the basin, in which the underwater tests were conducted, compelled establishment of a new and protected testing station. Accordingly, some 15 miles north, on Harbor Island, the new Inco Marine Laboratory was built to provide expanded facilities and an even better "Ocean Test Tube."

This new Harbor Island station, along with the atmospheric test racks retained on the shore of Kure Beach, now widen the scope of cooperative enterprise for fighting industry's common enemy — corrosion.

The vast amount of valuable data accumulated over the years will continue to be made available to all industry, as well as to government agencies for whom and with whose cooperation much of the research has been undertaken. You are invited to consult us on your corrosion problems.



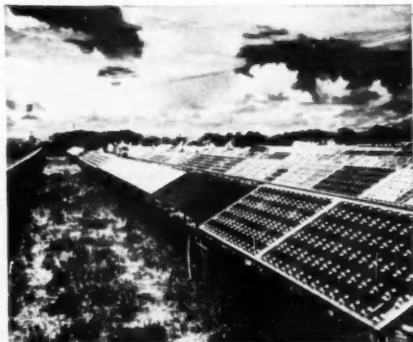
THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK 5, N.Y.



Lowering piling test specimens into place. Sea water is something more than a mixture of chemicals; its corrosive action over an extended period can be studied properly only by exposure of specimens to attack under natural conditions.



Running water troughs. For studying the action of sea water flowing at moderate velocities, specimens are immersed in the troughs, shown above. The total length of trough used for this purpose now amounts to about 600 feet.



Atmospheric and spray test lot. Shown above is part of the atmospheric test lot at Kure Beach in which over 20,000 specimens have been exposed, some for over nine years. The racks face south, and the specimens, supported on porcelain insulators, are all set at a slope of 30 degrees.

AUTOMOTIVE INDUSTRIES

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April 1, 1951

Vol. 104, No. 7

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FOR LOW-COST

TORQUE CONVERTER COOLING...

USE STANDARDIZED HEAT EXCHANGERS

BY **YOUNG**



Trucks



Locomotives



Buses



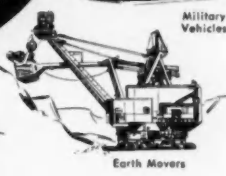
Young torque converter cooler, Model TC-3, is compact, light in weight and ruggedly built for trouble-free service in any applications.



Military Vehicles



Stationary Engines



Earth Movers

Young-built fluid coolers were original equipment on some of the first torque converter installations, and have been thoroughly tested under actual operating conditions. Illustrated above is one of three types of coolers now in service on the nation's "big name" equipment. Their shell and tube bundle design means easier maintenance—longer, more efficient service without clogging. Check with Young Engineering Service on your specific requirements; Young standardized units pay-off in low-cost heat transfer.

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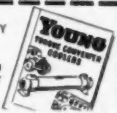
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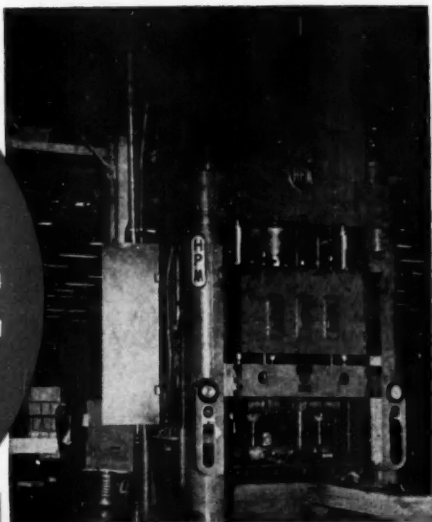
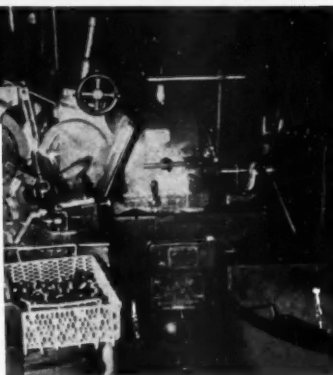


Use Texaco Regal
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UNFAILING HYDRAULIC POWER



FOR GRINDING — A large midwestern plant reduced hydraulic oil consumption by 74%, simply by changing to *Texaco Regal Oils (R&O)*. These turbine-quality oils keep hydraulic systems free of rust, sludge and foam ... give longer service between oil changes.



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hydraulic
use**

Leading hydraulic equipment manufacturers approve *Texaco Regal Oils (R&O)*, and you can get the exact viscosities you need to assure best possible performance from every type and size of hydraulic unit. Let a *Texaco Lubrication Engineer* give you full details. Just call the nearest of the more than 2,000 *Texaco Distributing Plants* in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



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National Acme Tool engineers began, months ago, to think out—and prove out—the best methods for quick, automatic production of these orders.

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Use this ready-made experience—put the job on Acme-Gridleys and benefit by our knowledge of the tooling, tolerances and times required. Our engineering experts will be glad to help you swing into action for quick rearmament production on your present Acme-Gridleys.

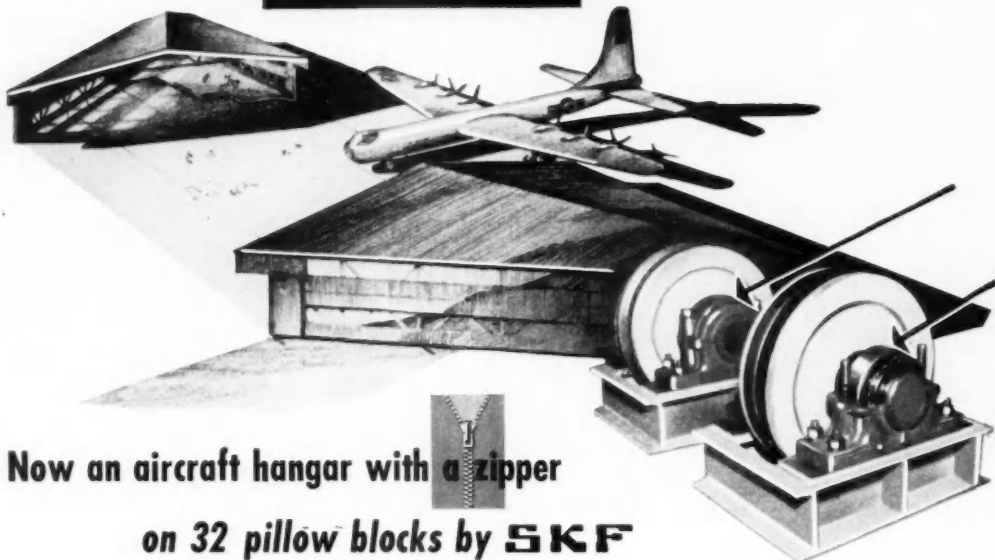
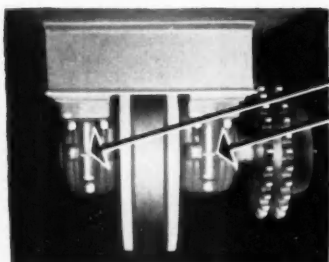


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*For information—including startling cost analyses—write Mitchell Mobilhangar Corp., 509 Fifth Ave., New York 17.

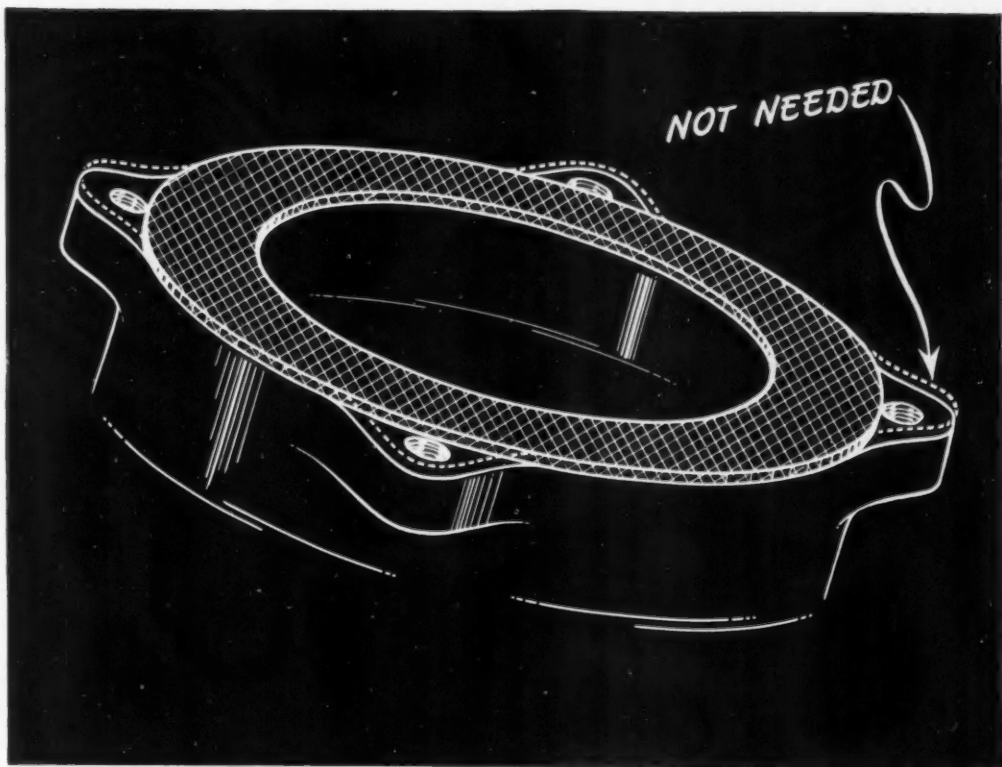


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surface finish
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AND PILLOW BLOCKS**

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Simplifying gaskets for military applications

It is always desirable to keep gasket shapes simple. In military applications, such simplicity may offer especially important benefits. For example, manufacturing time may be reduced or gasket delivery may be improved. In some cases both advantages may result.

The drawing above shows an instance where a compressible gasket material permitted removal of gasket ears. These ears, used simply to hold the gasket in position, could be eliminated because it was not necessary to seal around the bolts or prevent moisture from accumulating between the flanges.

By making the O.D. of this gasket tangent to the edge of the holes, accurate positioning is assured. The resulting unrestrained gasket remains firmly seated because it is cut from one of Armstrong's Cork-and-Rubber Compositions, a material that deforms in the direction of the load without appreciable sideflow. Such a compressible gasket has little tendency to creep. Even on flanges covered with oil, its cork-dotted surface resists slippage. In addition, its excellent resistance to fatigue makes it ideal where field conditions make gasket re-use necessary or desirable.

Another way in which Armstrong's Cork-and-Rubber Compositions prove effective is in overcoming

supply difficulties caused by joint designs that call for special-section molded parts. Often, these parts can be replaced with square or rectangular-section compressible gaskets. Being truly compressible, such gaskets will deform sufficiently to seal tightly.

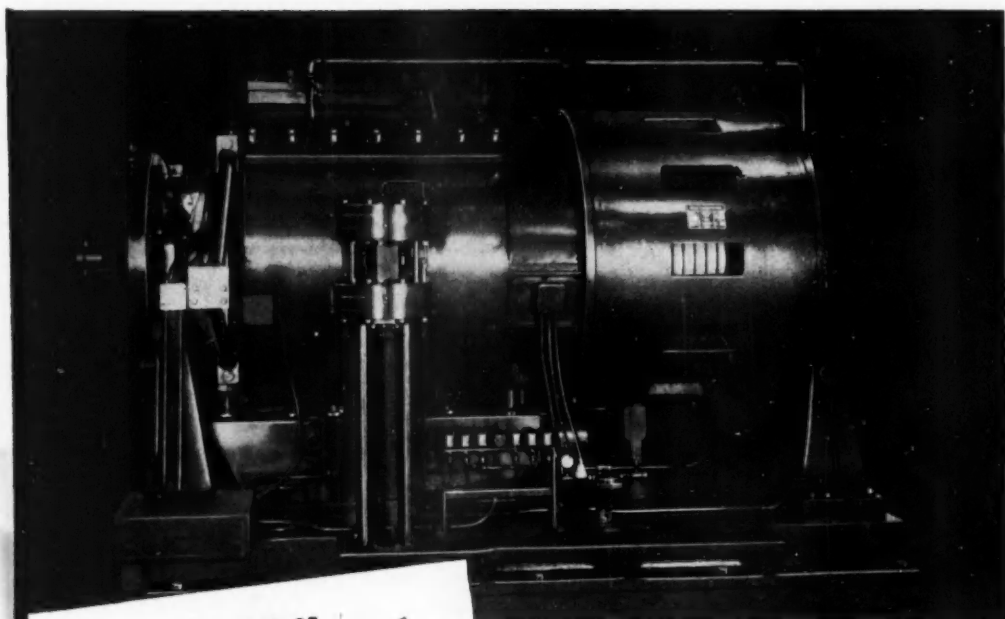
Truly compressible gaskets often speed production in other ways. They may be lathe-cut or die-cut to shape, thus eliminating the time and expense of mold-making. Mirror finishes, too, usually are not necessary because compressible gaskets permit wider tolerances.

There are standard Armstrong Cork-and-Rubber Compositions designed to meet all grades of the general military specifications covering this type of gasket materials. For information on new gasketing materials being developed to meet special military requirements, consult your Armstrong representative.

See Armstrong's Gasket Materials manual in Sweet's file for product designers for other design suggestions covering both joints and gaskets. For a personal copy of this manual, write to the Armstrong Cork Company, Gaskets and Packings Dept., 1504 Arch St., Lancaster, Penna.



ARMSTRONG'S Gasket Materials



EATON
DYNAMATIC
DYNAMOMETERS

**Accurate
 Vibration-Free Readings
 at All Speeds**

Dynamatic Dynamometers are characterized by extreme smoothness and freedom from vibration, providing quick, accurate readings at all speeds. Convenient, positive control is accomplished with simple, inexpensive, electronic equipment. These units are extremely flexible in operation, and are adaptable to a wide range of conditions, producing very high torques at low speeds, operating easily at high speeds, and offering a smooth and infinitely adjustable range of torque. Completely self-contained A.C. operation.

Dynamatic Dynamometers are extremely simple, compact, light in weight, and moderate in cost. They are available in absorbing, motoring, and universal types. The latter provide for instantaneous switching from absorbing to motoring and back, so that friction horsepower of an engine can be determined at attained operating temperatures.

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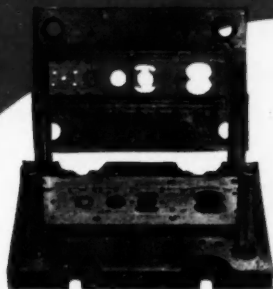
*160 pieces a minute to tolerances
of less than .0005"!*



These rotor and stator elements
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per minute. With half thousandth place
part tolerances, almost perfect die
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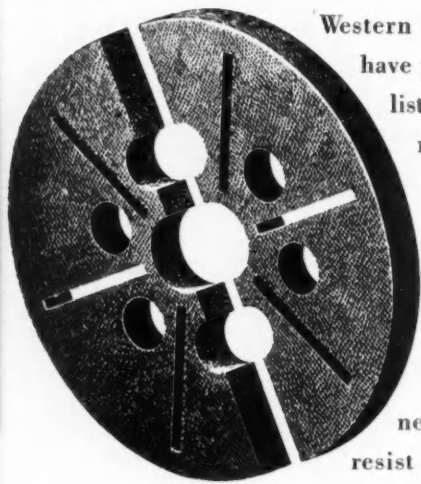
PRECISION DIE SETS . . . STANDARD AND SPECIAL



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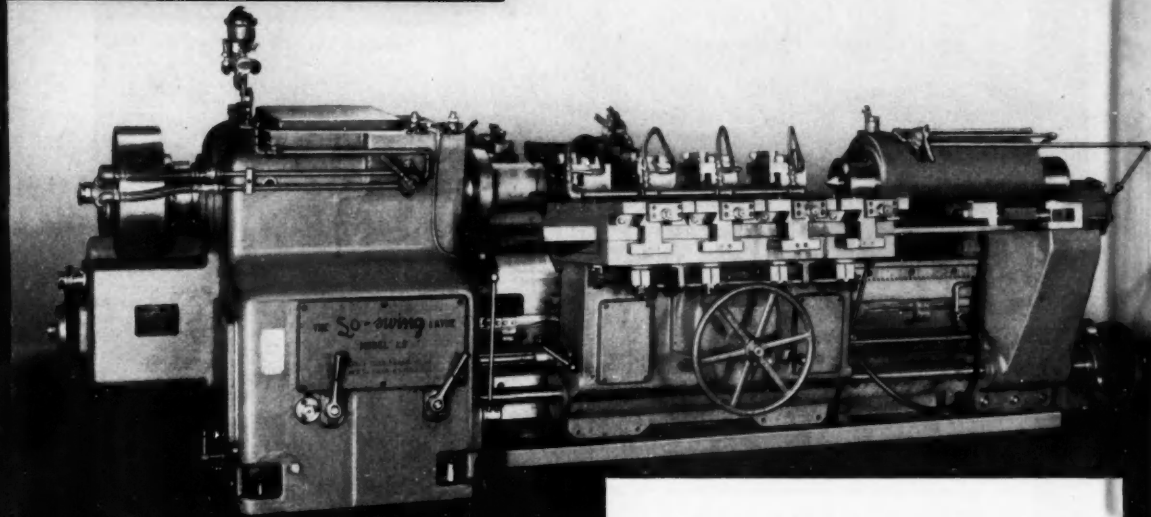
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► **Lo-swing IMP Lathe.** Fully automatic, for small diameter work at high speeds.

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► **Model AP Lo-swing Lathe.** Semi-automatic, for work requiring long carriage travel.

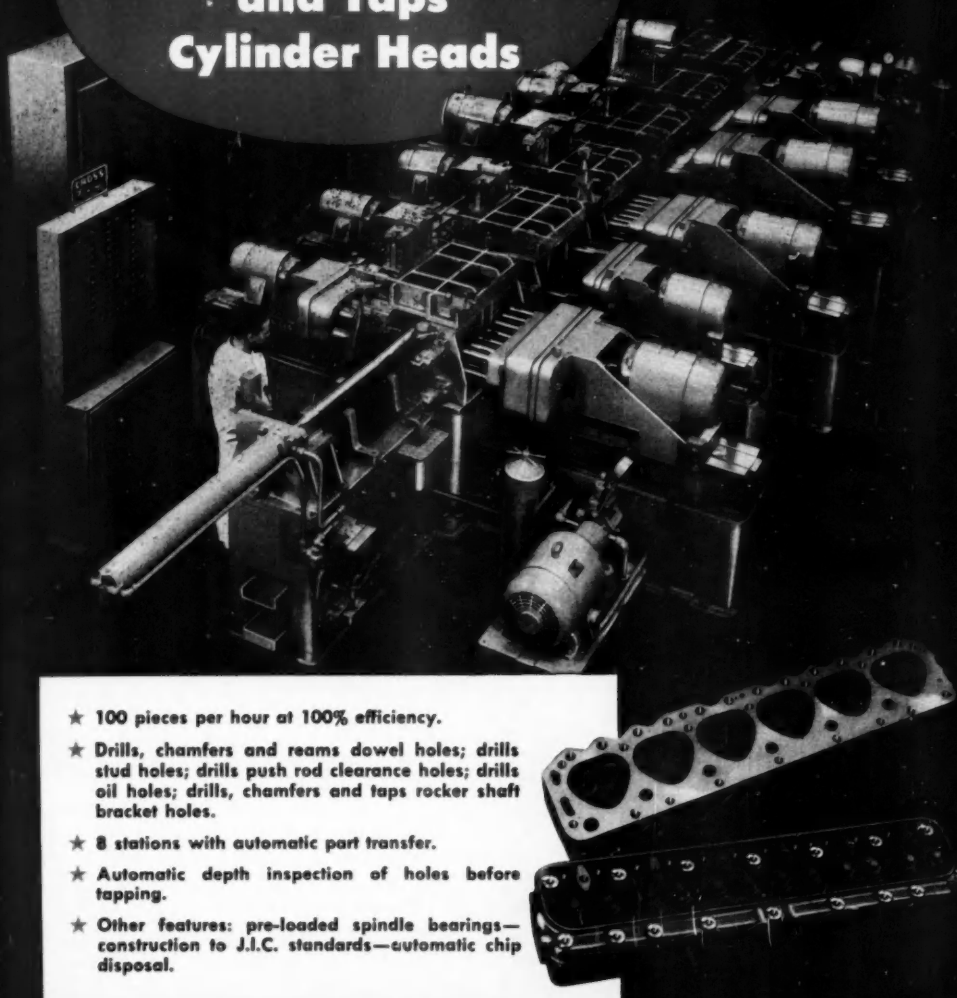
► **Model LS Lo-swing Lathe.** Semi-automatic for turning long gun barrels and heavy shells up to 13' in diameter.

► **Model CS Drilling and Centering Machine.** Fully automatic for all centering operations.

Lo-swing AUTOMATIC LATHES

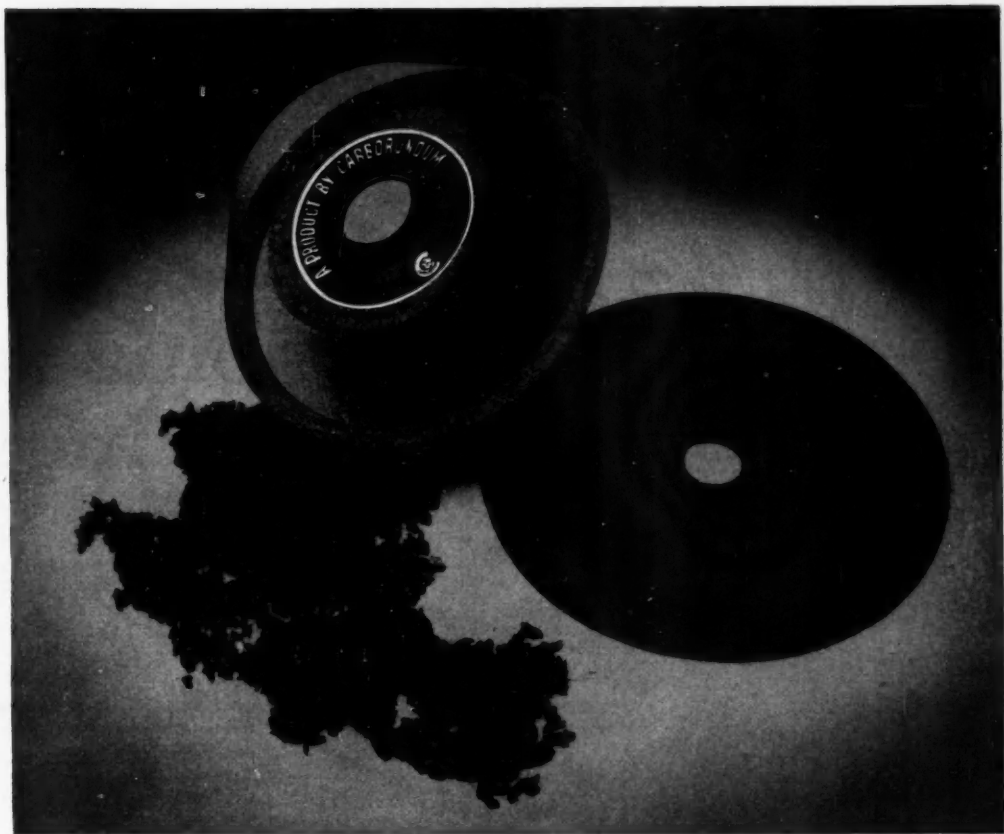
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by Cross*

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makes ALL Abrasive Products...to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.

AUTOMOTIVE INDUSTRIES, April 1, 1951

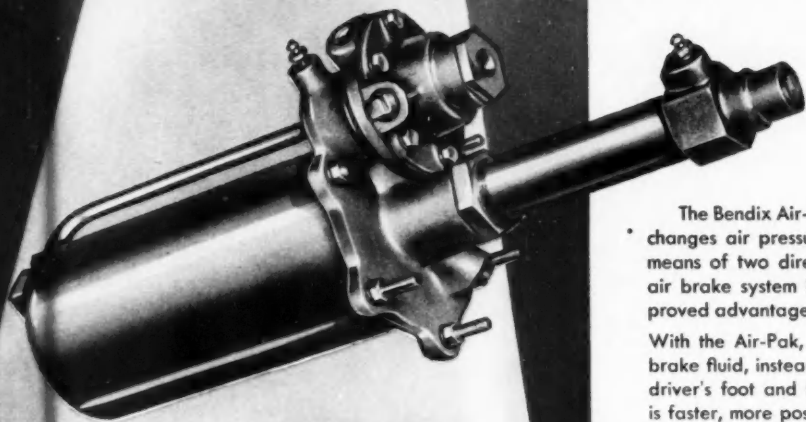
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Bendix AIR-PAK

An Air Brake

Unit that

Revolutionizes Heavy Vehicle Braking!



The Bendix Air-Pak is an air-hydraulic unit that changes air pressure into hydraulic pressure by means of two direct connected pistons. Thus an air brake system is combined with all the well-proved advantages of hydraulic brake actuation.

With the Air-Pak, a non-compressible column of brake fluid, instead of air, connects between the driver's foot and the brake shoes. Brake action is faster, more positive and under better control. Also, brakes can be applied instantly by foot-power alone—a valuable emergency stand-by if brakes are needed before air pressure builds up, or if air pressure fails for any reason.

The Air-Pak is similar in design and principle to the well known Bendix* Hydrovac*, vacuum-hydraulic braking unit, in use today on more commercial vehicles than any other power braking system. Bendix has built more than 2½ million Hydrovacs; thus the Air-Pak has a matchless background of related engineering and manufacturing experience.

A descriptive folder on Air-Pak
will be sent on request.

*REG. U. S. PAT. OFF.

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High Spots of This Issue

Now:—METALS

Introduced with this issue is a new Department, to be devoted to monthly analyses of the Metals Market. Mr. William F. Boericke, who will handle it, will keep AUTOMOTIVE INDUSTRIES readers critically informed on events in this increasingly crucial field. For Mr. Boericke's opening report, turn to "METALS", page 43.

★ Extruded Hollow Propeller Blades

Taking two years to develop, a new process utilizes only 400 lbs of steel for a 10-ft propeller blade instead of the 750 lbs required by current production methods. Process has been worked out by the Propeller Div. of Curtiss-Wright Corp., under auspices of the U. S. Air Force at Adrian, Mich. Page 32.

★ Army in Korea Using "Old-War" Vehicles

Here is an exclusive, on-the-scene account. It describes how four types of general-purpose vehicles and special-purpose cars and trucks—along with airpower—have given the Eighth Army telling mobility in reducing the enemy's numerical advantage. Vehicles are old faithful, World War II vintage. Page 34.

★ Chrysler Torque Converter

Significant operations on the Chrysler torque converter are here described and illustrated, starting with the stamping of blades for the turbine and impeller. Modern equipment affords high production efficiency. Page 38.

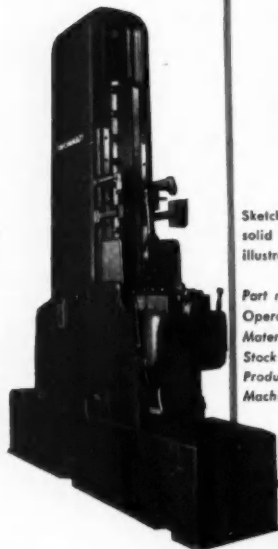
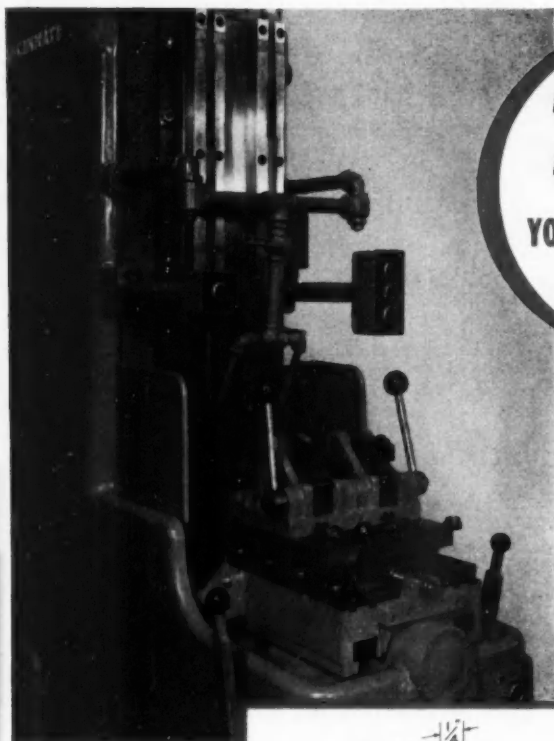
★ Canberra Twin-Jet Bomber

To be built by three nations—England, Australia, and the U. S. A.—this light twin-jet bomber made a record-breaking east-west flight to this country—3300 miles from Ireland to Washington, D. C., in 7 hrs and 35 min. Page 44.

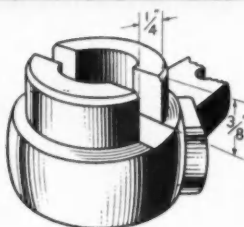
★ 22 New Products And Other High Spots, Such As:

Making the Cadillac front bumper and guard assembly; White's Mustang engine which develops 150 hp; how tool life is affected by heat-resisting alloys; how production planning is boosting department efficiencies; how torsional vibrations are minimized in reverse and reduction gears; and the Oldsmobile Super 88 which features new body and leaf-type rear suspension.

*News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3*



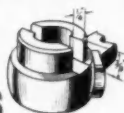
CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach Machine. Seven sizes are available, up to 10-ton broaching force, 66" stroke. Write for catalog No. M-1389-2.



Sketch of part showing slot broached from the solid on the CINCINNATI Hydro-Broach Machine illustrated here.

Part name.....	Operating shaft lever
Operation.....	Broach slot
Material.....	Steel forging
Stock removal.....	From solid
Production.....	260 per hour
Machine.....	CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach

**For Production Jobs
like this** ➔



YOUR BEST BET IS

HYDRO-BROACH

Obvious solutions to machining problems are seldom the best. For example, take the job of machining a $\frac{1}{4}$ " x $\frac{3}{8}$ " deep slot in operating shaft levers at the rate of 260 per hour. An analysis of broaching vs. milling by Cincinnati Application Engineers proved that broaching was more economical. A simple hand clamping fixture, mounted on a CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach, holds two parts. Two rows of broaching cutters (inserts) broach two parts at the same time, holding close accuracy of width, depth and central location of the slot. Preset Cycle Control, an exclusive Cincinnati feature, simplifies operation and improves safety of the setup. The ram does not descend through its cutting stroke until the operator touches the cycle start buttons—both hands are out of the way. CINCINNATI Hydro-Broach Machines offer many advantages for low-cost surface broaching operations in your shop. You can tool them up yourself, or if you prefer, our Application Engineers are ready to lend a hand. May we hear from you?

THE CINCINNATI MILLING MACHINE CO.
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**MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID**



AUTOMOTIVE INDUSTRIES, April 1, 1951

News of the AUTOMOTIVE INDUSTRIES

Vol. 104, No. 7

April 1, 1951

Ford Sales Chief Predicts Car Output to Continue

A Ford official has stated that it is highly unlikely that even the most serious emergency conditions will stop production of passenger cars and trucks altogether. Walker A. Williams, Ford vice president in charge of sales, said that the nation's economy is too closely linked to passenger car and truck transportation to allow complete stoppage of production.

Prospects Improving for 1952 Models

While plans for 1952 models are still uncertain it now looks as though chances are much better for the automobile industry to complete tooling and other preparatory work so that substantial changes will go through as originally scheduled. Major tool builders report that tools and other equipment were placed far enough in advance of war work so that they will be completed before defense orders in tool shops get rolling in heavy volume. However, it is going to be touch-and-go for some manufacturers to get their machine tool commitments out ahead of the time when war work will take all machine tool facilities. This is particularly true of Ford because it has a tremendous tooling program under way to equip new plants at Cleveland and Detroit for production of at least four and possibly five new engines. Work on equipment to produce a new V-8 engine for DeSoto and Dodge are reported well along.

Studebaker Profit Down Despite Record Sales

Although production and sales last year set a record, net earnings of Studebaker Corp. declined to \$22.5 million from an all-time high of \$27.5 million achieved in 1949. The company last year built and sold 334,554 cars and trucks, 9.7 per cent more than the previous year. H. S. Vance, chairman and president, said that the decline was due largely to increased Federal taxes,

including the new excess profits tax, and a substantial loss in production during the fourth quarter because of model changeover and labor difficulties.

Plymouth Retains Third Place in Car Sales

Final registration figures show that Plymouth retained its traditional third place in sales despite a strong bid by Buick to take over that spot last year. Buick probably had its best chance in 1950 when Plymouth was crippled by a 100-day strike last spring. However, when production was resumed, Plymouth turned on full steam and was able to end the year 11,560 cars ahead of Buick, its nearest challenger.

Car Output Predictions Confused

With optimism and pessimism alternating every time the wind changes direction, it is practically impossible to make any sound and positive prediction about passenger car production during the months ahead. Trucks appear to be in a favored category so far as materials are concerned and will undoubtedly fare better than passenger cars. Some sources are predicting that a 20 per cent cut of permitted steel use for automobiles below the average quarterly use for the first quarter of 1950 will have only a very small effect on production during the second quarter. Another body of opinion holds that with steel already crit-



ON THE BOTTOM

Under 10 ft of water a new waterproof Willys Jeep negotiates the sand-bottomed pool at Marineland, Fla. Professional diver Frank McCallum tests the vehicle for U. S. Army Ordnance officers, engineers and cameramen watching through the pool's portholes. Extension pipes on the vehicle's snorkel tubes to keep intake and exhaust pipes above the water line constituted the only special equipment for the vehicle, a standard M-38 model. Secret of the performance is the vehicle's completely waterproof engine and electrical system.

News of the AUTOMOTIVE

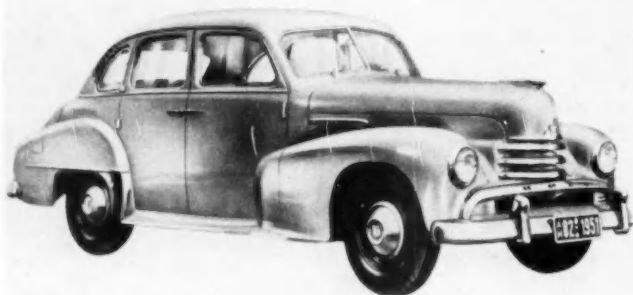
ical, output is going to drop from present high levels. The plain fact is that no one actually knows what is going to happen. Production in the first quarter was very high and it is unofficially estimated at about 1.95 million units, approximately 300,000 ahead of the same number a year ago when Chrysler plants were out all of January and February during a strike. However, there is no doubt that this high production was achieved by depleting reserves of both raw materials and component parts which had been built up during the latter months of 1950. These have now largely been used up and whether or not schedules can be held at anywhere near the first quarter levels is dependent entirely upon ability of the manufacturers to get steel. Aluminum and copper are also under limitation orders, but these are only academic at present because steel is the governing factor. GM recently laid off a total of 3300 workers at Cincinnati and St. Louis plants as a result of materials shortages.

There is evidence that high policy level thinking in Washington has changed in recent weeks and it is understood now that the CMP plan originally scheduled for July 1 will not be put into effect because the materials shortage is not expected to last as long as previously thought. Instead it is reported that DO ratings will be assigned to certain essential items such as replacement parts, leaving other products untouched with manufacturers free to scramble for the materials not assigned under DO ratings. That is the outlook at the moment, but any

sudden shift in international developments might again bring about a pressure for stricter government controls on all production.

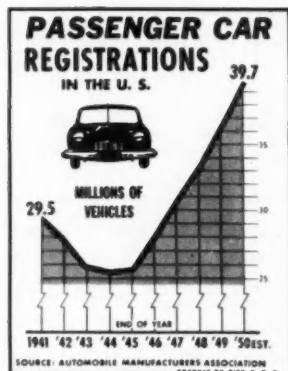
Natural Rubber Content Reduced in Tires

A new rubber order effective March 15 will result in lower natural rubber content for most truck and passenger car tires, but is flexible enough to permit tire builders to keep percentages of natural rubber in large over-the-road sizes high enough for satisfactory service. Average percentage of crude allowed by sizes are as follows: 7.50 down, 38; 8.25 through 9.00, 75; 10.00 through 12.00, 90; and over 12.00, 92. However, manufacturers are permitted to exceed these contents up to 99 per cent in large sizes, provided they make adjustments in other sizes and lines so that total usage of natural does not exceed their quota. Truck tires using the higher percentage of synthetic are much better than the old S6 used during World War II and are satisfactory for normal usage, according to tire industry spokesman, but not under conditions of overloading and excessive speeds. Truck tires will fare better than passenger car casings in both quality and percentage of production. The situation might improve within a few months, especially if world conditions prompt the government to ease its stockpiling of natural rubber.



GERMANY'S NEWEST

One of Germany's newest automobiles is this 1951 Opel-Kapitan. A four-door sedan, the new car is powered by a six-cyl engine and is reported to have a maximum speed of 80 mph.



Ford Plane Engine Order Totals \$565 Million

Ford has revealed that its contract for production of 4000-hp Pratt & Whitney reciprocating aircraft engines totals an estimated \$565 million, the largest defense order value revealed in the automotive industries thus far. The engine will be built in the former Tucker plant at Chicago which was used during World War II by Chrysler for aircraft engine production. The company is negotiating with a large number of sub-contractors and suppliers to furnish a large proportion of the 20,000 parts going into the engine. In addition, Ford will employ about 2500 workers at its Rouge plant to supply components for the engine. When the contract is in peak production, it will involve employment of more than 20,000 persons.

Ford has already acquired more than half the machine tools it needs to start production of aircraft engines in its Chicago plant, and many are already installed on production lines. The balance of the machinery required is on order, or is being rehabilitated from a machine tool pool as fast as possible.

\$195 Million Tank Job Awarded Fisher Body

GM's Fisher Body Div. has been awarded a contract to produce tanks for the Army. Total value of the order is estimated at \$195 million. The tanks will be built in the plant at Grand Blanc, Mich., used by Fisher during World War II for tank production and occupied by Buick as a parts warehouse since the end of the war. Buick purchased the plant a few weeks ago.

INDUSTRIES

from the government, but will turn it over to Fisher and will move its operations to Flint and Detroit. Other Fisher Body plants including those at Grand Rapids and Flint will supply components for the tank operation. Sidney J. Sabourin, who has been resident manager at the Hamilton, O., Fisher plant, has been named manager of the tank plant. Bart Cotter has been named chief engineer. He was formerly assistant chief engineer of the Central engineering division in Detroit.

Chrysler Announces Three War Orders

The Chrysler Corp. has revealed that it has signed three additional defense contracts previously unannounced. Chrysler also disclosed that it has defense orders totaling about \$1 billion; this together with GM's recently-announced over \$3 billion and Ford's \$1 billion in war contracts brings the total of military contracts awarded thus far to the Big Three to over \$5 billion. Rangefinders will be built for the Army in an addition which is to be built at the Airtemp factory in Dayton, O. The company also has contracts to make submarine indicator nets and searchlight reflectors, but where the work will be done was not revealed.

The Budd Co. to date has been awarded defense contracts aggregating more than \$110 million. These contracts call for the production of a variety of items: parts for tanks and jet engines, ammunition components, Army truck cabs, cargo bodies, wheels, hubs and drums.

A \$4 million contract for production of super-streamlined combat fuel tanks for U.S. Air Force North American Aviation F-86 Sabre jet fighters has been awarded to the Seeger Refrigerator Co., St. Paul, Minn.

GM's Rochester Products Div. is sharply increasing manufacture of emergency fuel control units for jet engines. The plant produces the fuel controls for Allison J-35 engines, which power Republic F-84 Thunderjet fighter planes, a large number of which will be built by GM in its Buick-Oldsmobile-Pontiac assembly plant in Kansas City, Kans.

Link Aviation, Inc., now has more orders on its books than it had at the peak of its production activities in World War II. This was learned when E. Allan Williford, vice president and general manager of Link, announced that the company has been awarded a \$6 million development and production contract for flight simulators. The devices will simulate operation of the

F89-C jet fighter plane. Delivery will be started next year. The order is the third contract for flight trainers received by Link in the last two months and brings the firm's backlog of orders up to about \$25 million.

Packard Acquires Site for Jet Engine Plant

Packard has acquired 55½ acres of additional area adjoining its proving ground in Utica, Mich., near Detroit, which will be available for building manufacturing and test facilities for military work. Packard has a contract to build turbojet engines for the Air Force and also has a Navy order totaling \$20 million for Diesel engines. It is understood that a plant will be built on the newly-acquired site to handle the jet engine contract and possibly the Diesel engine job also. In a report to stockholders, Packard reveals earnings last year of \$5.16 million, compared with \$7.7 million the previous year. However, the total revealed a sharp increase during the last quarter, since for the first nine months of last year Packard had losses of \$1,144,000.

Mack and Diamond T Add to War Orders

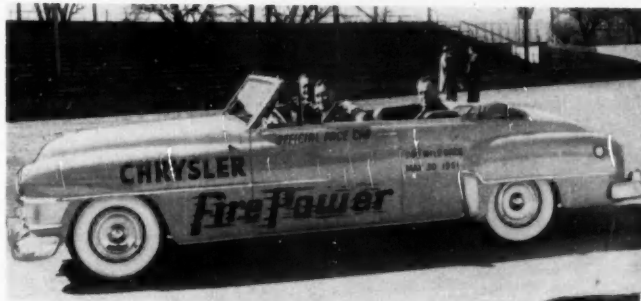
Mack Manufacturing Corp. has been awarded a \$25 million contract for tactical five-ton dump trucks. They will be produced at the Mack plant in Allentown, Pa. Diamond T has also been awarded an additional contract totaling about \$500,000. It covers production of axle housings and front axle assemblies.

Willys Gets Chevrolet Plant

Willys-Overland has acquired a former Chevrolet plant at Anderson, Ind., for production of a large military order for jet engine parts. The 13-acre plant was operated by Chevrolet during World War II for production of aluminum airplane parts. Willys is starting immediately on a \$7 million tooling program to prepare the plant for production. Size of the order was not revealed, but is well in excess of the \$63 million order that Willys recently was awarded for jeeps.

K-F Tooling One Third of Plant for Planes

The Kaiser-Frazer Corp. is starting to tool about one million sq ft, or about one-third of the plant area, in its Willow Run plant for production of cargo planes for the Air Force. Operations have gone on a two-shift schedule to provide for output of 450 cars on each shift to maintain the 900-cars-a-day schedule. The company estimates that by the end of this year the aircraft contract will require between 5000 and 8000 additional employees. The contract for C-119 planes is now estimated at well over \$500 million in total value. More than 20 carloads of machine tools and other equipment taken from World War II stocks are already on hand for installation and other equipment is being delivered to sub-contractors who will furnish about one-third of the major components. Included among suppliers are Murray Body, which will build booms, fins, and



PACE SETTER

This Chrysler New Yorker convertible will set the pace at the 1951 Indianapolis Race. Powered by the new 180-hp V-8 FirePower Engine, the car is shown on the speedway at Indianapolis. At the wheel is D. A. Wallace, president of the Chrysler Div., Chrysler Corp., who will guide the 33 racing cars around the track; at his side is Wilbur Shaw, president and general manager of the Speedway; and seated in the rear seat is Tommy Milton, chief steward of the track.

doors, and Willys-Overland, which will supply all landing gears.

Employment up 40 Per Cent on Jet Engine Job

The General Electric Co. will require more than 10,000 employees at its expanded turbo-jet manufacturing operations at Lockland, O. The employment total is an increase of more than 40 per cent over earlier estimates. Facilities have also been expanded beyond previous estimates by the leasing of an additional 500,000 sq ft of manufacturing space.

Chevrolet to Produce Jets in Govt.-Owned Tonawanda Plant

A huge Government-owned plant in Tonawanda, N. Y., has been turned over to GM's Chevrolet Motor Div., for jet engine production under the largest single military contract ever awarded to Chevrolet. Alton A. Way, manager of Chevrolet's River Rd. plant, took possession for Chevrolet of the adjoining Government plant. This plant was also operated by Chevrolet in World War II for the manufacture of aviation engines.

The value of the over-all jet engine

contract placed with Chevrolet was not disclosed, but was estimated in some circles to run to several hundred million dollars. Other Chevrolet plants are expected to participate in the program.

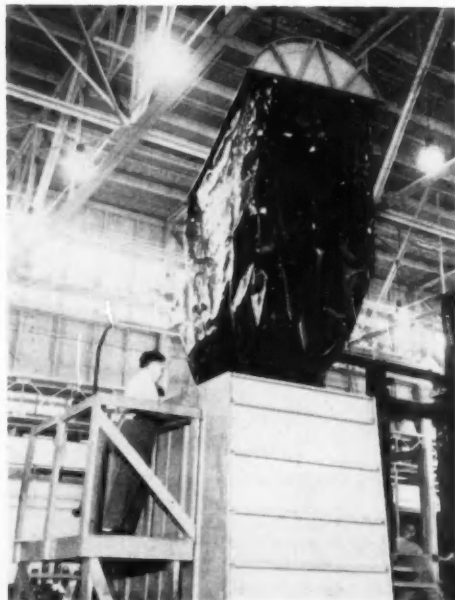
"Because of the extent of the work in prospect, we expect there will be added employment in the Buffalo area, but not for many months," T. H. Keating, GM vice president and general manager of Chevrolet, said in Detroit. Production of jet engines is scheduled to start in 1952. The company has received a letter contract from the Air force to provide preliminary facilities for the production job. Work will begin immediately on extensive tooling and development of production machines to reactivate the plant.

A. O. Smith Leases Packard Plant

The A. O. Smith Corp. has leased the Packard Motor Car Co. plant in Toledo where Packard built engines during World War II. Smith will use the facilities for the production of landing gears under a sub-contract for Boeing Aircraft. The plant, which has about 300,000 sq ft of manufacturing space, is undergoing rehabilitation and will be operating by the end of the year.

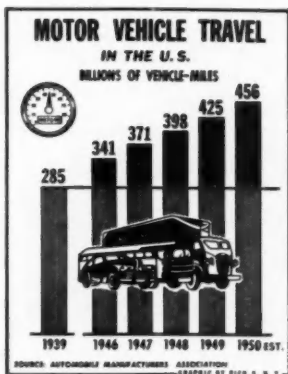
Allison Marks Production of 10,000th Jet Engine

The first jet engine built by GM's Allison Div. about the middle of World War II after months of heartbreaking effort ran for about 90 seconds before excessive heat caused the metal to buckle. Since then, such rapid strides have been made that authorized time between overhauls on current Allison engines is 500 hours which compares favorably with reciprocating engines. The intensive development that progressed during peacetime paid off handsomely when jet planes were thrown into the Korean war. At ceremonies in Indianapolis on March 14, Allison celebrated the delivery of its 10,000th jet



FITTING A GIANT

Built by the Goodyear Tire & Rubber Co., this Pliocel nylon fuel cell is being fitted into the metal shell of the giant new fuel tank for the U. S. Air Force B-36 bomber. The tank which holds 3000 gallons of fuel, now being made by Goodyear, is said to be the largest ever produced.



engine to the Air Force and also officially unveiled its newest jet engine, the J-35-A-23.

The engine is the most powerful and most efficient in fuel consumption of any jet engine ordered by the armed forces. Specific power rating and fuel consumption have not been released officially, but it is understood that the engine develops 10,000 lb thrust, dry, without afterburner. It will be used on the XB-47C bomber, but because the engines are more powerful only four will be required instead of the six that now are being used. The efficiency of the J-35A-23, plus the savings in weight, will increase the bomber's range substantially.

The engine has deicing features on the air inlet vanes and the bullet nose in the air intake. Heat for deicing is bled from the compressor. An automatic ice detector is supplied. Retractable screens are provided for protection against intake of foreign material while on the ground and open automatically in flight. The 20 per cent increase in fuel consumption over

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earlier engines is due to the higher compression ratio and improved design of all parts. E. B. Newill, GM vice president and general manager of Allison, said that the proposed jet engine program will have a material effect on the supply of critical alloys and that attempts are being made to substitute less critical materials although not too much progress has been made in that direction as yet. He said also that if cooling efficiency could be increased or better thermal control of parts achieved, less critical alloys could be used. He revealed that two-thirds of Allison's requirements for building the jet engines are to be supplied by hundreds of vendors.

ASBE Elects Garman President for 1951

Harry G. Garman, GM's Fisher Body Div., has been elected president of the American Society of Body Engineers. Other officers include Harold V. Atnip, Chrysler, vice president; Gordon J. Lawton, Briggs, secretary; and Edward L. Pangborn, Chrysler, treasurer. Trustees are: I. Louis Carron, Carron Co.; Lynn A. Fill, Motor Products; William K. Norwick, Fisher Body; Charles W. Bugbee, Ford; Stanley C. Vahey, Budd; L. James Berridge, Woodall Industries; and Arthur L. Bradley, Creative Industries.

Atlas Corp. Takes Over Indian Motorcycle

Atlas Corp., New York investment firm, has acquired control of Indian Motorcycle Co. All connections between the company and Indian Sales Corp., owned by a British company, have been dissolved. Atlas has obtained control of the board of directors through long-term options to purchase holdings of major bank creditors. Manufacture of motorcycles will continue in addition to defense work on a sub-contract basis.

North American Forms Electronics Unit

Creation of a new Electro-Mechanical Div. to handle the company's electronic manufacturing operations has been announced by North American Aviation, Inc. The new division will engage in the design, development and manufacture of electronic equipment and complete guidance control systems for missiles and aircraft produced by North American Aviation and other companies.



GETTING WINGS

A Martin P5M-1 Marlin flying boat begins to sprout its wings. Marlin's are now in production for the U. S. Navy at the Glenn L. Martin Co.'s plant near Baltimore, Md. The airplane in the foreground has been undergoing its water tests, in which the inside of the hull is filled with water to see that there are no leaks. The massive center wing section is attached at the same time, giving the bird-like effect. Two other Marlin hulls are in assembly fixtures in the background.

Buick Packaging Parts with Electronic Unit

GM's Buick Motor Div. is using a new electronic packaging machine which can count and package up to 13,000 small automobile parts an hour. The device is installed at the main parts warehouse and is capable of counting and boxing nuts, bolts, screws, washers, bushings, and hundreds of other parts regardless of whether they are made of metal, fiber, plastic, or glass and no matter how small. It can be adjusted to count any number of parts from one to 1000 and is so simple that a worker can learn to operate it with a few minutes' instructions. It is equipped with 18 electronic tubes and two electric eyes and is adaptable for counting more than 2000 small parts sold in groups of several in a carton.

General Sales Tax Asked to Replace Car Excise

A Federal general sales tax in place of a proposed boost of 13 per cent in excise taxes on new automobiles has been suggested by A. E. Barit, president of Hudson Motor Car Co. As chairman of the Automobile Manufacturers Association taxation committee, he appeared before the House Ways and Means Committee to protest the suggested increase in excise taxes on the basis that it is discriminatory and self-defeating. In a prepared statement, he said that if further excise taxes are required they should be spread over all consumer items except food. During a question period after reading

the formal statement, Mr. Barit made his proposal for a Federal sales tax. He said that the automobile industry should bear only its fair share of taxes and that provision should be made for automatic repeal of emergency excise taxes when the emergency is over.

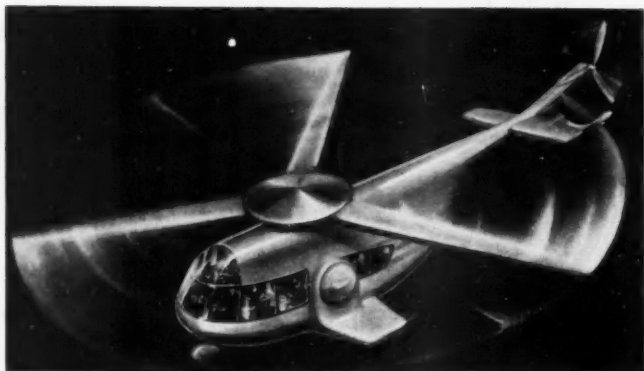
1950 Vehicle Scrappage Up Sharply from 1949

Scrappage of cars and trucks last year totaled 2,842,551 units, according to R. L. Polk & Co. Cars and trucks scrapped in 1949 totaled 1,704,079. Last year's scrappage consisted of 2,315,110 passenger cars and 527,441 trucks. Percentage-wise, passenger car scrappage in 1950 reached 36.59 per cent of new registrations and 5.8 per cent of all cars in use. For trucks corresponding figures are 60.42 per cent and 6.43 per cent. Although scrappage last year was nearly 50 per cent above the 26-year average, the ratio of scrappage to vehicles in use was not too far out of line because of the much greater registrations existing at the end of 1950 which, according to Polk, were 39,418,772 passenger cars and 8,198,529 trucks for a total of 47,617,301.

National Batteries, Inc. to Build Mich. Plant

National Batteries, Inc. has acquired a site at Monroe, Mich., for a new \$1 million industrial battery plant. Construction will start soon on the plant which will produce batteries to fill Ordnance contracts.

News of the AUTOMOTIVE



THE GYROCOPTER

The Wilford Airline Gyrocopter, shown above, is designed for military transport and feeder line operation, according to the Pennsylvania Aircraft Syndicate. Powered by two 1820 Wright engines each developing 1000 hp, the plane has a gross weight of 18,000 lb, and is said to have a maximum speed of 135 mph at 7000 ft, and a range of 400 miles at cruising speed.

Cross Expands Plant in Detroit

Cross Co. has announced the expansion of its facilities for the manufacture of special machine tools. A new Detroit plant has added 10,000 sq ft of floor space.

Clark Equipment Net Shows Sharp Gain

Net profit of Clark Equipment Co. last year is reported at \$4.78 million, compared with \$2.65 million in 1949. Sales last year were about 28 per cent ahead of the previous year and are expected to reach \$100 million in 1951.

Houdaille-Hershey Sells Muskegon Specialties

Houdaille-Hershey Corp. has sold its entire interest in Muskegon Specialties Co. to Fred L. Flanders of Muskegon. Houdaille owned all of the common stock in the company and about 13 per cent of the Class A stock.

GM Fourth Quarter Net Cut by Higher Costs

One fact that has been overlooked in the voluminous discussion of GM's all-time high earnings of \$834 million in 1950 is that earnings during the fourth quarter of last year were down sharply from the previous quarter. At

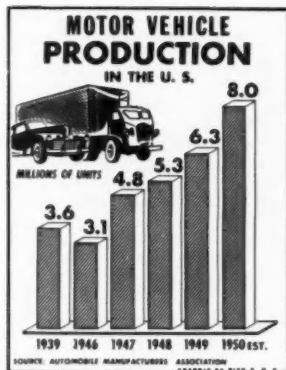
the end of nine months, GM had earned \$702.6 million indicating a fourth quarter net of \$131.3 million, compared with \$217.3 million for the third quarter. While it is true that model changeovers during the last months of the year affected production somewhat, these were of short duration and would hardly account for a drop of \$86 million. Since GM made provision for increased taxes in its third quarter earnings report, higher taxes also would not account for the drop in earnings between the two quarters. It seems more likely that the reduced profit can be accounted for by the substantial increases in costs which could not be compensated for by higher prices because of the government freeze order, effective Dec. 1, holding prices at previous levels.

This cost price imbalance also undoubtedly affected earnings of Chrysler and Studebaker, both of which produced all-time record volume of cars and trucks with resulting peak dollar sales and still reported a lower net profit than the preceding year. While some of the independents show profits ahead of last year it is generally believed now that first quarter earnings will not be as high as in the same period a year ago because of reduced production and an unfavorable cost-price relationship. The profit situation was not aided to any degree by the recent 3½ per cent price increase on cars, because at the same time wages went up approximately the same amount. Another interesting item in the GM

report is the amount paid last year in taxes. Income taxes and other levies were substantially greater than for any previous year, totaling \$1.2 billion. The total tax bill was equal to 15 cents for each dollar of sales, \$2.08 for each dollar of dividends paid, and 63 cents for each dollar of payroll.

Bugatti to Get One Model on Market Toward End of Year

Evacuated, requisitioned, fought over and pillaged, the Bugatti factory in Alsace was the most seriously damaged of all French automobile works and is the last to get back to normal production. Present plans are to get one model on the market towards the end of this year. Known as the model 100, it will have a 201 cu in. super-



charged engine with two overhead camshafts, and a five-speed mechanical transmission, and will replace the model 57 in production until the outbreak of the war. Body dimensions have been increased and suspension improved. A smaller model of about 100-cu in. piston displacement is being developed, but no production date has been fixed. This will also have a four-cyl supercharged engine with twin overhead camshafts. Since the death of Ettore Bugatti, the technical management of the works at Molsheim has been in the hands of Pierre Marco.

Tool Makers Withdraw Future Price Quotes

Pricing problems are plaguing the machine tool industry. Because of uncertainties of long range pricing policy by the government many machine tool manufacturers are withdrawing present price quotations. They say it is

INDUSTRIES

impractical now to make any kind of firm pricing on equipment which may not be delivered for two years or more in view of rising costs and no assurance that these will be recognized under government pricing policies. Some companies are accepting orders on the basis that prices will be set at the time of delivery. Machine tool representatives have been discussing the problem with OPS officials in an effort to find a workable price ceiling formula for the industry. Under current ceilings several manufacturers are in a price vise between higher costs and frozen prices. This has to some extent affected the sub-contracting or work to smaller companies although some of the larger ones are still farming out part of their production.

Ford to Build Parts Warehouse in Canada

Ford Motor Co. of Canada, Ltd., Windsor, Ont., has announced the purchase of a 10-acre site from the City of Regina on which it plans to erect a new parts and accessories warehouse costing in excess of \$1 million. Announcement of the project was made by George H. Bates, general manager of the parts and accessories division of Ford of Canada.

"Regina is ideally situated for overnight shipment to all principal centers on the prairies," said Mr. Bates, "and the new warehouse will replace one which has been housed since the war in temporary quarters there." He said that the building will be of one-story, brick construction with 75,000 sq ft of floor space under roof. Construction will begin as soon as necessary materials and skilled labor are available and it is hoped the new depot will be in operation in about a year.

ASTE Honors Sen. Flanders With Lifetime Membership

The American Society of Tool Engineers has awarded an honorary lifetime membership to Senator Ralph E. Flanders of Vermont. Senator Flanders has been associated with the machine tool industry since 1897 and has been a senior member of the Society since 1949. He was president of both Jones & Lamson Machine Co. and Bryant Chucking & Gronder Co. from 1933 to 1946, when he was elected to the Senate. At its annual convention in New York in March, the Society also elected J. J. Demuth, Sligo, Inc., St. Louis, as president. Other officers elected are: L. B. Bellamy, Detroit, Sterling Grinding Wheel Div. of Cleveland Qparrie Co., first vice president; Roger

F. Waindle, Elgin Watch Co., Elgin, Ill., second vice president; T. J. Donovan, Jr., Donovan Co., Philadelphia, third vice president; W. A. Thomas, Ford of Canada, Ltd., secretary; H. C. McMillan, Seeger Refrigerator Co., Evansville, Ill., treasurer; and Dr. H. B. Osborn, Tocco Division Ohio Crankshaft, assistant secretary-treasurer.

Ford Puts Vital Data on Microfilm Record

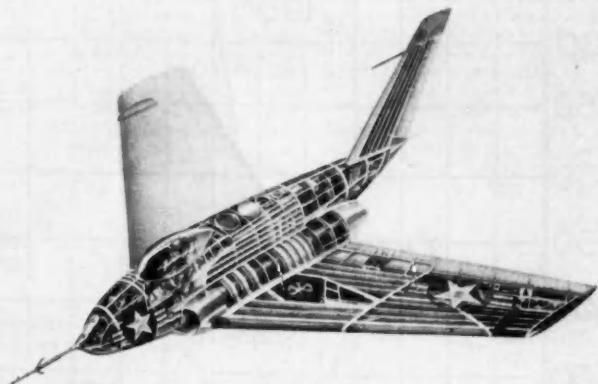
The Ford Motor Co. is insuring against loss of vital records in the event of a bombing attack through an extensive microfilming program. During the past two years the company has put more than 1.25 million of its designs and tracings onto microfilm and at least three million more are scheduled to be recorded. The microfilm records include all important drawings of dies, gages, jigs, fixtures, and old and current engineering drawings of cars, trucks, and engines dating from the earliest model T through the 1951 models. Negative copies of the films have been placed in fireproof storage vaults in Dearborn with positive copies stored in bombproof underground vaults at a location far removed from the Rouge.

North American Using Statitron

Called the Statitron, an electron hammer that strikes 60,000 billion times per second during testing of metals, is used at North American Aviation not to smash atoms, but to displace atoms thus being capable of changing the physical properties of a test piece of metal. Physicists then can determine the amount of energy required for such displacement. The Statitron is one of the newer facets of the Atomic Research Laboratory of North American at its Downey, Calif., facility. According to Dr. Donald Eggen, physicist in charge of the North American Statitron, the Statitron does not keep charged particles circling at very high speeds, as does the cyclotron; rather, the Statitron hauls the particle slowly up a high "electrical hill" on a moving insulated belt and then lets it fall down the "hill."

Machine Tool Builders to Get NPA Help

The NPA has set up priority assistance for machine tool builders to obtain the machine tools and equipment they themselves need to produce their



WHAT'S INSIDE

The internal details of the USAF's newest flying laboratory, the Northrop X-4 research airplane, are revealed for the first time in this phantom drawing. The fuselage of the X-4 is packed with equipment and instruments, including National Advisory Committee for Aeronautics stability and control instruments. Integral fuel tanks are built into the multi-cellular wing panels. The X-4 is one of the smallest planes ever built for the Air Force. It measures about 25 ft from wing tip to wing tip, and it is approximately 20 ft long.

News of the AUTOMOTIVE INDUSTRIES

products. Previously the machine tool industries had been appealing to the Munitions Board for aid, but this was insufficient since the board is limited to issuing DO orders for machine tools actually needed to fill defense orders. To obtain NPA assistance, machine tool makers must give detailed information and must show that a priority rating is the only means of obtaining the required item.

Polarized Headlights Considered in Mass.

Legislation to require polarized head lighting equipment on trucks and cars is under consideration in Massachusetts this year. Even if passed, how-

ever, it would not go into effect for a long time, possibly several years. A provision in the bill requires that it would not become effective until other states with an aggregate of 50 million population have passed similar laws. Vehicle manufacturers are opposing the measure on the ground that the system is unsatisfactory from the standpoint of cost to car and truck owners and also because it creates many problems for owners of vehicles not equipped with polarized lighting and for pedestrians who would be blinded. Under the proposal, the vehicles would be equipped with two complete lighting systems—polarized and non-polarized, the latter for passing and city driving. All cars would re-

quire a viewing screen to prevent blindness when meeting polarized equipped vehicles. Other costly requirements of the polarized system are a 70 amp generator, relays, heavier wiring, and quite possibly a much larger battery.

Fairchild to Build New Guided Missile Facilities

New facilities for the Guided Missiles Div. of the Fairchild Engine and Airplane Corp. will be constructed on a 32-acre site at Wyandanch, L. I., N. Y. Construction of the first unit, a 155,000 sq ft, one-story plant, will begin this month, and is scheduled to be in full operation by Sept. 1. The cost of the plant is estimated at \$1,750,000. The new Fairchild factory will be constructed to fit the special requirements of missile and missile guidance system development, S. M. Treman, general manager of the Guided Missiles Div. stated.

OPS Hints Car Dealers May Absorb Price Hike

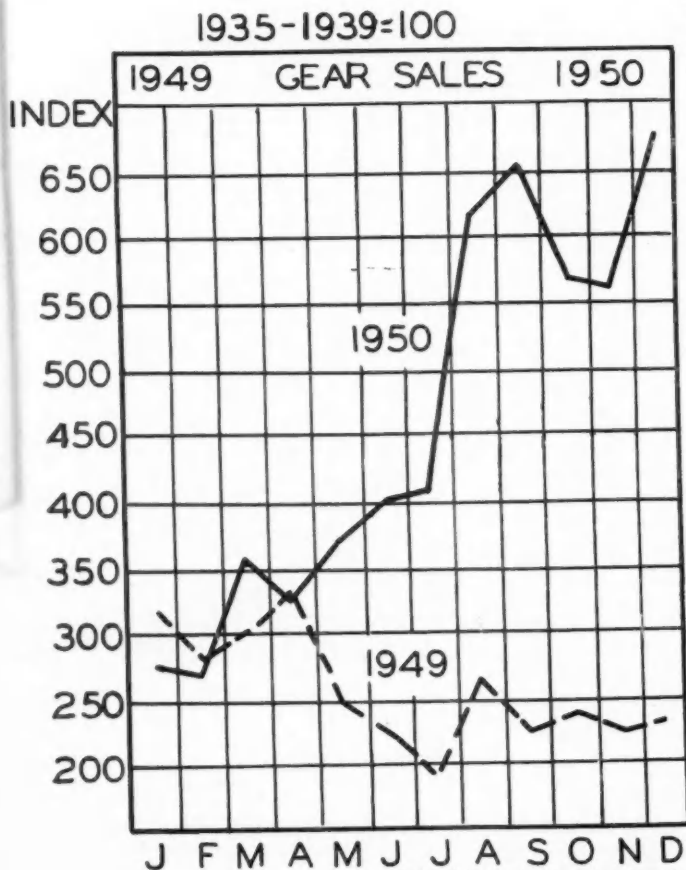
Although automobile dealers have been allowed to pass on to customers the exact dollar-and-cents increase to them because of the 3½ per cent increase allowed manufacturers, there have been hints that OPS a little later may require dealers to absorb part of the increase. It is not clear, however, whether such absorption will be on the latest 3½ per cent upward allowance or on a further increase which may be granted in May to manufacturers.

Reo Makes Sharp Gain After Loss in 1949

Reo Motors, Inc. has shown a sharp upturn in earnings for last year. After a loss of \$1.9 million in 1949, the company bounced back with \$2.1 million profit last year. The company recently completed the first of its two military contracts for 2½-ton trucks totaling more than \$100 million. Unfilled orders for commercial vehicles are also the largest in Reo's history.

Kaiser Interests Pay Off Aluminum Plant Loan

Henry J. Kaiser interests have paid off all indebtedness on five aluminum plants purchased from the government in 1946. A final payment of \$37.3 million was made 23 years ahead of maturity date. Total received by the government for principal, interest, and rental for the five aluminum plants built during the war was \$56.3 million.



Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Towmotor Corp.—C. Edgar Smith, executive vice-president, was named president succeeding Lester M. Sears, founder and president who was elevated to chairman of the board. **James H. Coolidge**, vice-president and treasurer of Thompson Products, Inc., was appointed a director.

General Electric Co., Aircraft Gas Turbine Div.—L. T. Callahan has been appointed manager of operations of the divisions at Lynn and Everett, Mass.

General Electric Co., Welding Dept.—W. G. Arnold has been appointed manager of manufacturing.

Allis-Chalmers Mfg. Co.—Chester W. Schweers has been named director of sales of the general machinery division.

Federal Press Co.—L. E. Loshbough has been elevated to the presidency.

Studebaker Corp.—Russell Forgan, partner in Glore, Forgan & Co., investment bankers, has been elected a director.

Kaiser-Frazer Corp.—The election of Charles M. Hollis, controller, as vice-president was announced.

Fargo Motors Corp. (Chrysler Corp., fleet sales subsidiary)—Gervais W. Trichel has been appointed a vice-president and director.

General Motors Corp., Buick Motor Div.—Roy I. MacArthur has been appointed general superintendent of aircraft engine manufacture. Don F. Taylor has been made assistant general superintendent in charge of tank transmissions.

The Electric Storage Battery Co.—Roland Whitehurst, vice-president in charge of sales, was named a director.

North American Aviation, Inc.—L. L. Waite was elected vice-president in charge of the new Electro-Mechanical Div. Charles J. Gallant was elected vice-president and general manager of the Columbus Div.

The Trailmobile Co.—Election of two new directors has been announced: William A. Burns, Jr. vice-president and sales manager, and J. B. Wharton, Jr., vice-president and treasurer.

White Motor Co.—T. M. Evans, president of H. K. Porter Co., Inc., has been elected to the board of directors.

Howell Electric Motors Co.—The appointment of Richard P. Ballou as chief engineer has been announced.

Joseph T. Ryerson & Son, Inc.—John R. Fennie has been appointed manager of the Tubular Products Dept.

Bendix Aviation Corp., Bendix Products Div.—C. V. Johnson, manager of Landing Gear and Administrative Engineering, has been appointed manager of the Mishawaka, Ind. plant. Franklin C. Albright will take over Mr. Johnson's duties as manager of Landing Gear Engineering, while the administrative functions will be assigned to George W. Pontius, manager of Automotive Engineering.

The Weatherhead Co.—James M. Baker has been appointed vice president in charge of manufacturing.

The White Motor Co.—Kenneth Critzer and Edward J. Koberna were named assistant works managers.

Detroit Automotive Products Co.—H. D. McPeak of Bronxville, N. Y., has been appointed sales manager national accounts.

Boeing Airplane Co.—Added to the board of directors, increasing its membership from nine to thirteen, were William G. Reed, president of Simpson Logging Co. and executive vice president of Rayonier Inc.; J. P. Weyerhaeuser, Jr., president of Weyerhaeuser Timber Co.; Edward C. Wells, Boeing vice president-engineering; and John O. Yeasting, Boeing vice president-controller.

United States Steel Corp.—Herbert E. Smith was elected a director and a member of its finance committee, succeeding the late Robert C. Stanley.

Tide Water Associated Oil Co.—John M. Schiff has been elected a member of the board of directors.

The Yale & Towne Mfg. Co., Philadelphia Div.—The appointment of Fred C. Poppe as advertising manager was announced.

Danly Machine Specialties, Inc.—The appointment of Everett K. Morgan as general sales manager of the company's mechanical press line has been announced.



The Electric Storage Battery Co. — R. C. Norberg, chairman of the board of directors, has retired.

The Electric Auto-Lite Co., Foundry Div., William J. Valters, has been appointed manager.



Allis-Chalmers Mfg. Co., Tractor Div. — Willis G. Scholl has been named general sales manager.

Twin Coach Co., Aircraft Division plant, Cheektowaga, N. Y.—Fred J. Webb was appointed superintendent of production departments. James M. Millikin was named superintendent of tool manufacture. James J. Mecca becomes production manager. John P. Elliott was named plant engineer. Henry Banse was named second-shift superintendent. Ralph Condon was appointed assistant director of purchasing.

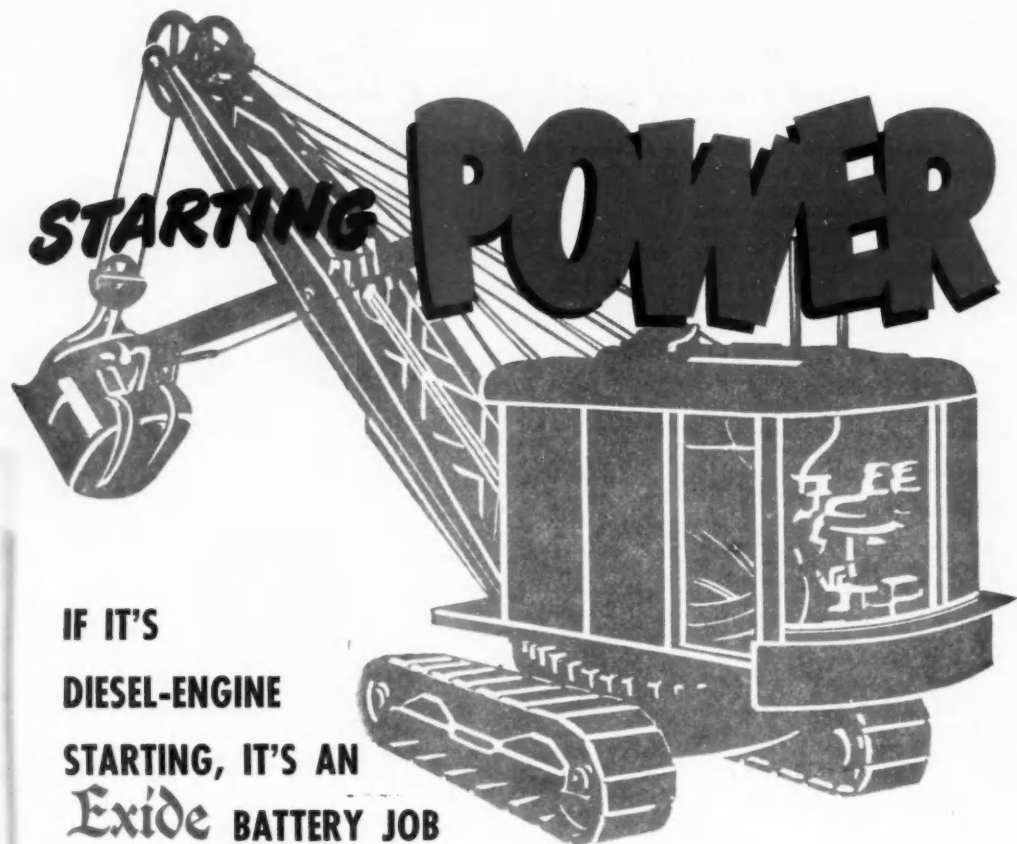
Westinghouse Electric Corp.—L. D. Rigdon, formerly manager of the Headquarters Manufacturing Div., has been named assistant to vice president in charge of manufacturing.

Necrology

Joseph E. Fields, 72, a director and former vice-president of the Chrysler Corp., died on March 12 in Palm Springs, Calif.

Robert C. Lee, 60, vice-president of White Motor Co., died on March 10 in Cleveland, O.

Henry Karl Hirth, 48, newly-appointed European manager for the Firestone Tire & Rubber Co., died on March 13 in Buenos Aires, Argentina.



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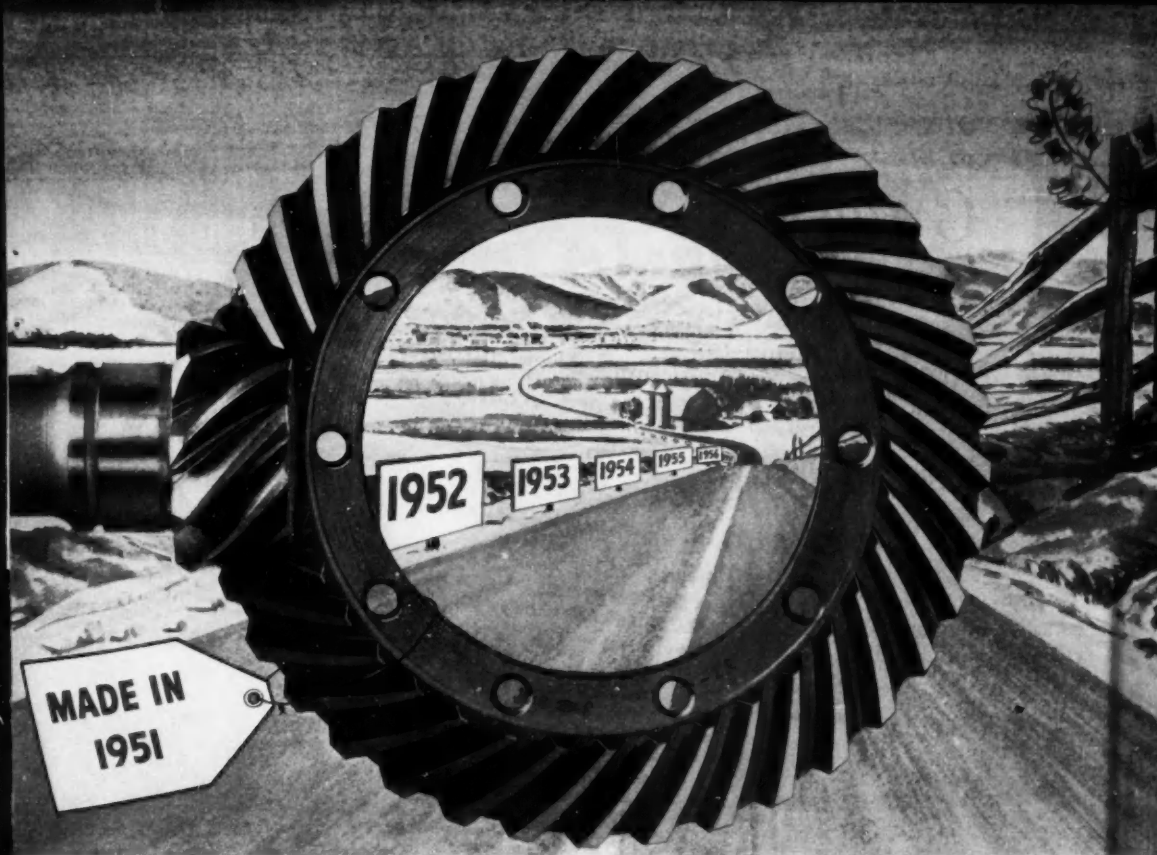
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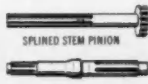
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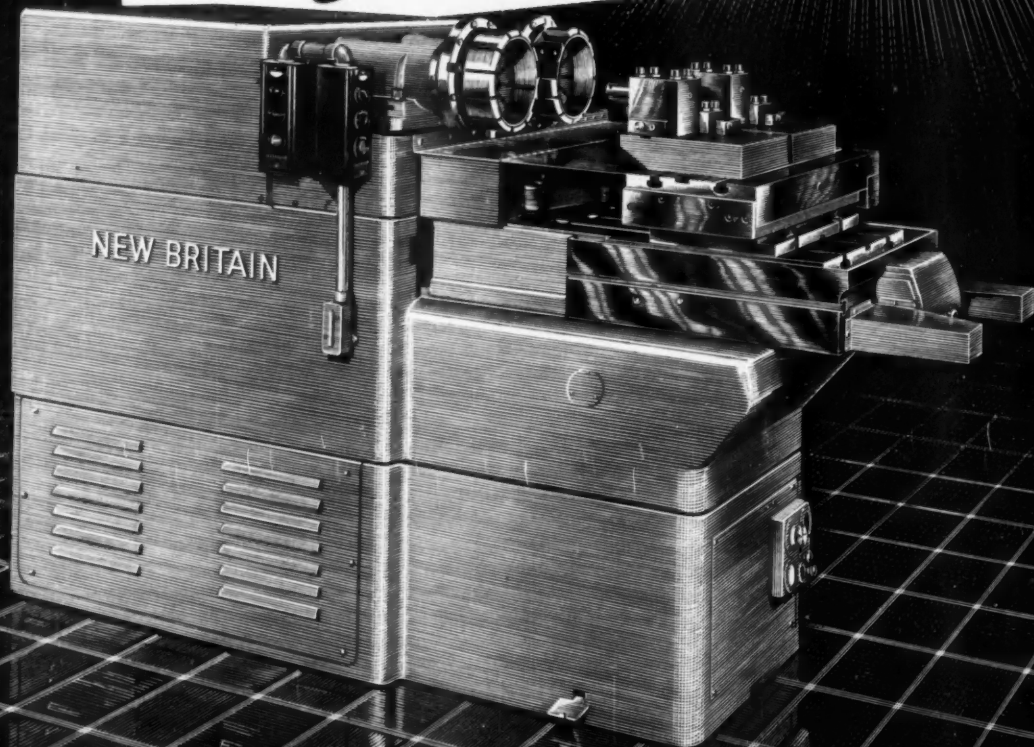
. . . increasingly closer tolerances on new products demand better methods. Now is no time to tolerate old machines. Users attribute high production and sustained accuracy to New Britain Precision Boring Machines.

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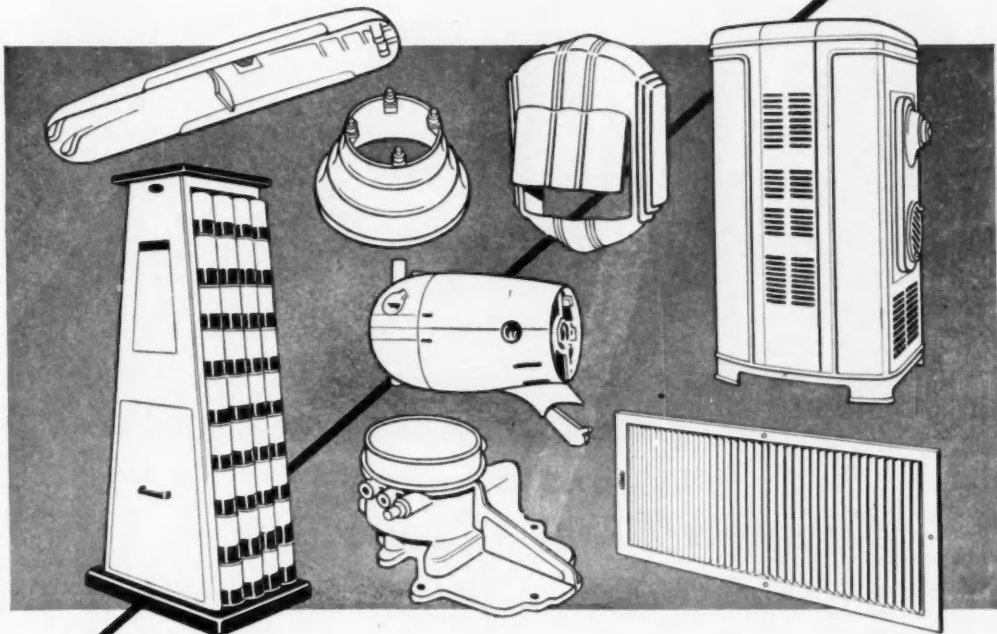
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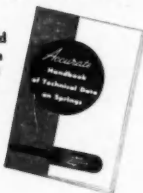
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Write for your copy of the new revised Accurate Handbook of Technical Data on Springs. This booklet has been out of print for some time and if you have previously requested a copy and have not received it, we would appreciate your asking again.

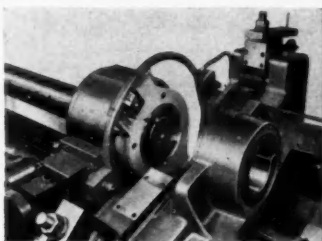
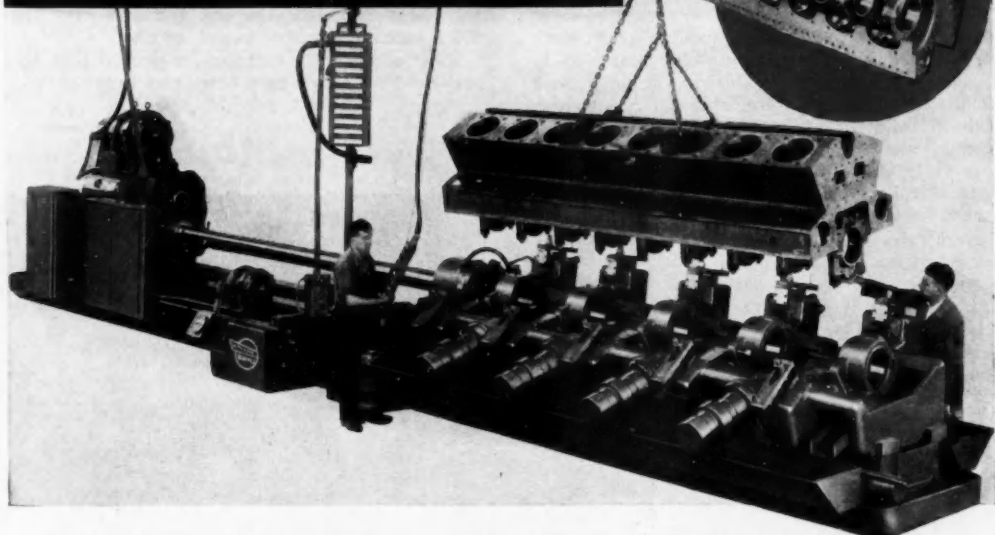


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How 9 DIESEL ENGINE MAIN BEARINGS ARE *Line-Bored Simultaneously*



Close up view showing outboard bar support. The support also carries the cutter head for boring and facing the 25" diameter generator rabbet. The boring bar is equipped with feed-out slide which permits straddle-facing the No. 1 Main Bearing. Slotted rotating bushings are locked automatically when bar retracts.



with

W. F. & JOHN BARNES No. 432 SINGLE-END MACHINE

• Nine main bearings, 9-3/8" diameter x 4-1/4" wide, are line-bored simultaneously, a front main bearing straddle-faced, and a 25" diameter generator rabbet is bored and faced in 16-cylinder Diesel Engine Crankcases by this sturdy Barnes Single-End Machine. Only one positioning and clamping of the workpiece in the machine is required. Rough and finish boring operations are completed without adjusting tools between cuts. Diameters and parallelism are held to extremely close limits.

Hydraulic Shifting of Workpiece Eliminates Removal of Bearing Caps

The boring bar is 7" in diameter and 15 feet long. The bar advances through slotted, rotating-type bushings. Hydraulic shifting of the workpiece permits advancing and withdrawing the boring bar without removing tools and bearing caps. Thus, with work handling reduced and machining operations simplified, productivity is substantially increased.

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Extruded Hollow Propeller

HOLLOW-STEEL propeller blades, usually produced from two flat plates by welding, brazing and forming, are now being made in one piece by the hot extrusion process. This new propeller blade manufacturing method was worked out by engineers of the Propeller Div. of Curtiss-Wright Corp., under the auspices of the U. S. Air Force, at the Air Force Development Center, Adrian, Mich.

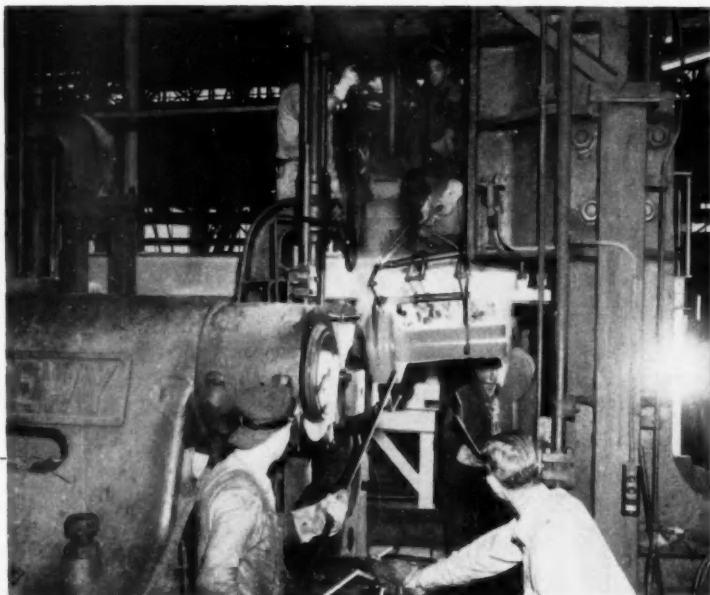
In contrast with present practice, the new process, which took two years to develop, utilizes only 400 lb of steel for a 10-ft propeller blade instead of the 750 lb required for current production methods. A finished 10-ft propeller blade weighs approximately 200 lb. In addition there are several other advantages, such as reducing the number of manufacturing operations, which will tend to cut costs.

For the initial operation, a 400-lb chrome-nickel-molybdenum steel billet is heated in a salt bath furnace to obtain the proper working temperature. The hot billet is then inserted

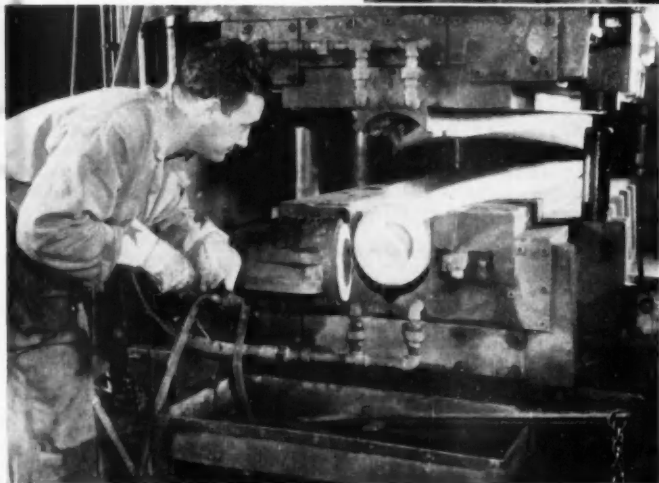
in a Loewy press for the first extrusion operation which forms the shank or hub of the blade.

Reheated after it is extruded for the first time, the partially-formed steel billet is returned to the press to

(Turn to page 74, please)



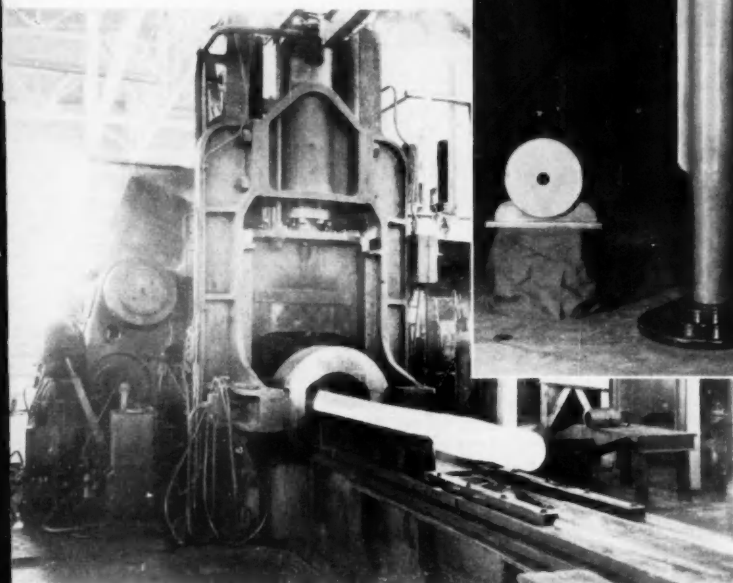
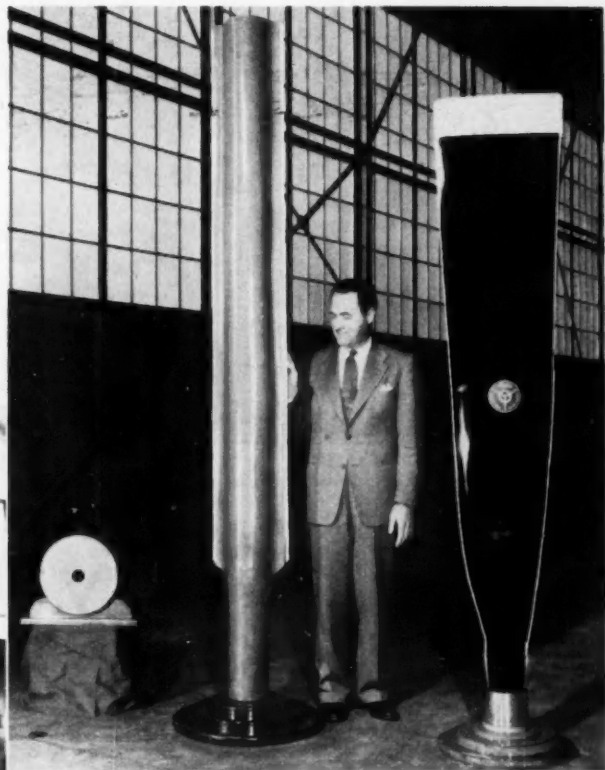
(Above) This view shows the partially-formed billet, which has been reheated following its first extrusion, about to be returned to the press for the second time.



(Left) The hot extrusion is placed into a die for the blow-up operation which gives it the proper shape. For this procedure, nitrogen under 1100 psi pressure is used to provide internal support. The breech block, normally placed over the shank or hub end, is shown open in this illustration.

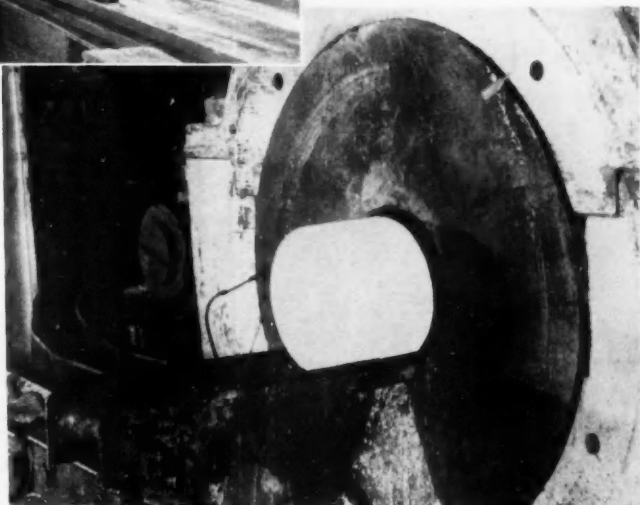
Blades

(Right) From 400-lb rough billet to a 200-lb finished Curtiss-Wright blade — the billet (left) is extruded into a seamless round tube (center) with ears or ridges running from the shank end to the tip and is in turn transformed into a finished blade (right) by flattening and forming. Francis R. O'Leary, general manager of the Propeller Div., Curtiss-Wright Corp., is inspecting the extruded propeller blade tube.



(Above) Shank end first, the hot extrusion emerges from the press on the third and final extrusion operation. The press used for this new blade manufacturing technique is rated at 5500 tons.

(Right) After removing the 400-lb chrome-nickel-molybdenum steel billet from a salt bath furnace, it is placed in the die container of the Loewy press for the initial extrusion operation.





This half-track carrying four machine guns is dug in at a United Nations airstrip.

**By
Robert
Schakne**

War Correspondent

Illustrations used in this article are International News Photos.

Army Fighting with World War

WITH THE U. S. EIGHTH ARMY IN KOREA—The infantry still walks on foot in this war but only during front-line operational

movements. The rest of the time the infantryman, like the rest of the army, is motorized.

Despite muddy twisted bumpy trails the Koreans call roads, the United Nations Army vehicles have transported combat troops up and down the Korean peninsula, with a mobility that along with airpower has reduced the enemy's advantage of numbers. Rely-

ing on four types of general-purpose vehicles manufactured during World War II and a large variety of special purpose cars and trucks, the Eighth Army has battled snow, ice, mud, swollen streams, and inadequate railroads.

Colonel E. C. R. Lasher of Washington, D. C., the Eighth Army's transportation chief, states that every



Trucks take to the water when Korean bridges are not strong enough for vehicles heavier than Jeeps.



This on-the-scene article, written exclusively for **AUTOMOTIVE INDUSTRIES**, was transmitted over a special wire from Tokyo to San Francisco and thence by air mail to Philadelphia, which is part of the world-wide news service maintained by **AUTOMOTIVE INDUSTRIES** with editorial representatives and correspondents in important centers. It was cleared through military security channels in Korea.

in Korea II Vehicles

general-purpose vehicle in the Korean war was made during World War II and used in the Pacific theater. These vehicles were brought up from the hundreds of islands where America fought during World War II and turned over to Army Ordnance. They were received by the GHQ Ordnance Section of the Far Eastern Command, rebuilt by an organization known

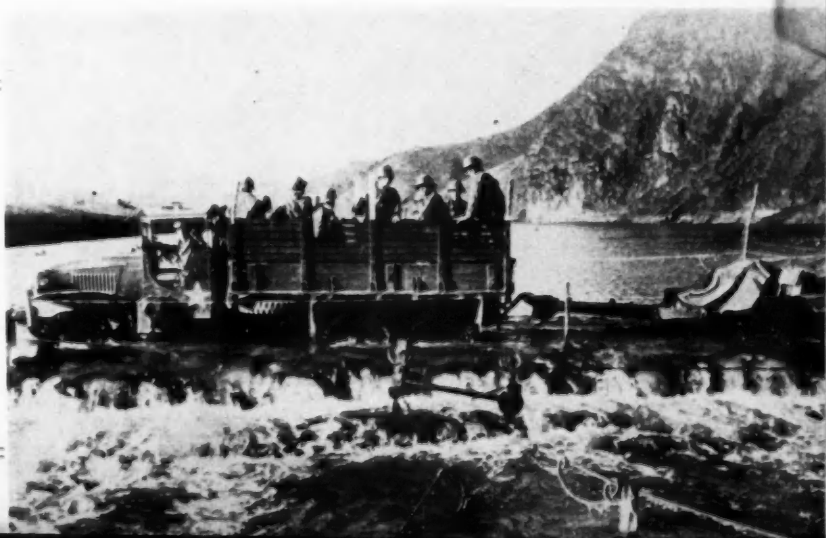
as the Base Industrial Group Number Five, the so-called "Big Five" consisting of Japanese manufacturers, and then sent to the Eighth Army in Korea. Frequently replacements for worn-out parts were manufactured in Japan. Japanese labor made the vehicles operational once again.

The Eighth Army's Deputy Transportation Officer, Colonel H. R. Honson of Mankato, Minn., says: "It's remarkable how well these vehicles have stood up. These are old used vehicles, many of which date back to 1935. But they've served their purposes, amazing as it sounds."

The general-purpose vehicles used by the Army are the reliable standbys—the quarter-ton jeep, the three-quarter ton weapons carrier, the 1½ ton personnel carrier, and the 2½ ton GMC six by six. These vehicles are used for about every purpose, but the old workhorse of the Army as it was in the last war is the 2½ ton GMC.

(Next page, please)

A 105 mm howitzer is towed across the Nakdong River by a truck carrying the gun crew.





World War II Vehicles in Korea

*A United Nations convoy
advancing past a knocked-
out Russian T-34 tank.*

The roads in Korea and the shortage of certain critical parts, Colonel Lasher points out, are the chief maintenance problems faced by the transportation corps. He terms the effect of the roads on vehicles "very brutal." Early in the war, he says, the Army suffered from a shortage of vehicles as well as spare parts. Even now certain items remain critically short.

Vehicles suffer from metal fatigue. Shock absorber linkage and springs are listed as the most critical items of the Army's transportation maintenance problem.

Despite the shortages of certain parts, Colonel Lasher says the Army vehicles have proved themselves

capable of handling the Korean roads, although some trucks already have piled up a record over the years of more than 75,000 miles.

"Fortunately," he says, "even though they twist and wind, Korean roads have good rock foundations so they can last through the rainy season. The roads have been used for centuries and have been packed down hard. As long as our vehicles stay on the roads, we can keep moving. The rains may slow us down but they won't stop us."

All the vehicles from quarter-ton jeep to the 2½ ton
(Turn to page 100, please)



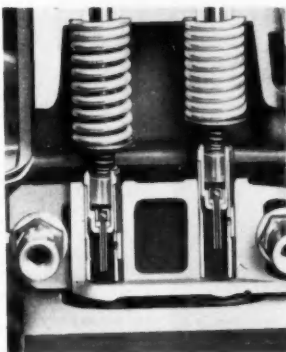
*Half-tracks and
trucks representing
part of an artillery
unit are shown here
transporting supplies
and equipment over
a typical road in
Korea.*

White's Mustang Engine Develops 150 Hp

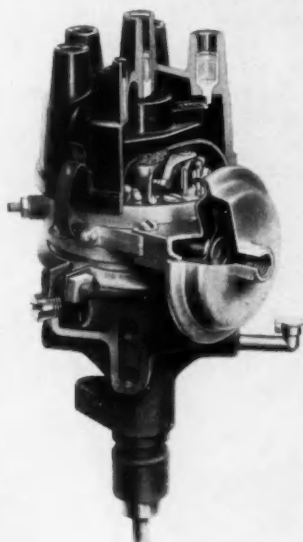
ADVANCEMENTS in design to achieve greater power output together with a saving in weight and still better fuel economy have been incorporated in the Mustang engine now being built by the White Motor Co. The new engine, known as the Model 250A, produces 150 hp operating on regular gasoline.

Greater combustion efficiency comes from an entirely new cylinder head combustion space used in conjunction with dome-head pistons. The combination. (Turn to page 100)

Cutaway view of two of the hydraulic valve lifters.



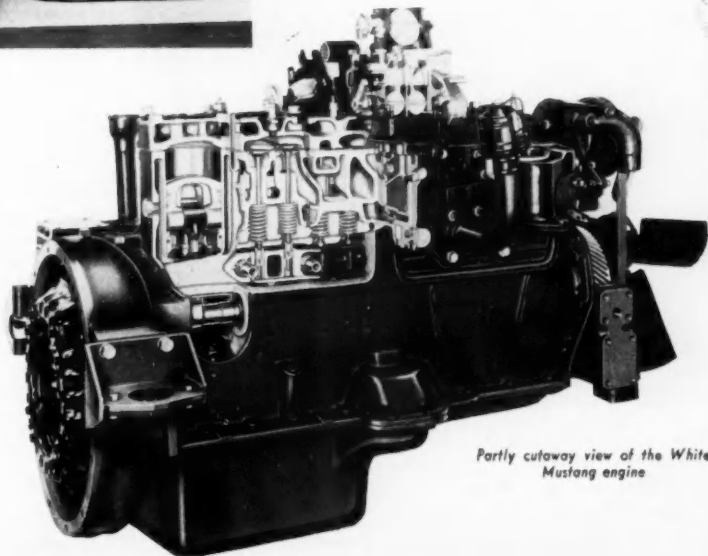
(Right) The full vacuum controlled distributor incorporates part of the integrally built governor.



Condensed Specifications of the White Model 250A Engine

No. of cylinders.....	6
Bore (in.)	4
Stroke (in.)	5.125
Displacement (cu in.).....	386
Maximum bhp	150 @ 3000 rpm
Maximum torque (lb ft).....	330 @ 1250-1500 rpm
No. main bearings.....	7
Weight (lb)	1,090

(Above) Domed pistons of low-expansion aluminum alloy have a Ni-Resist insert to provide a better surface for the top ring land.



Partly cutaway view of the White Mustang engine

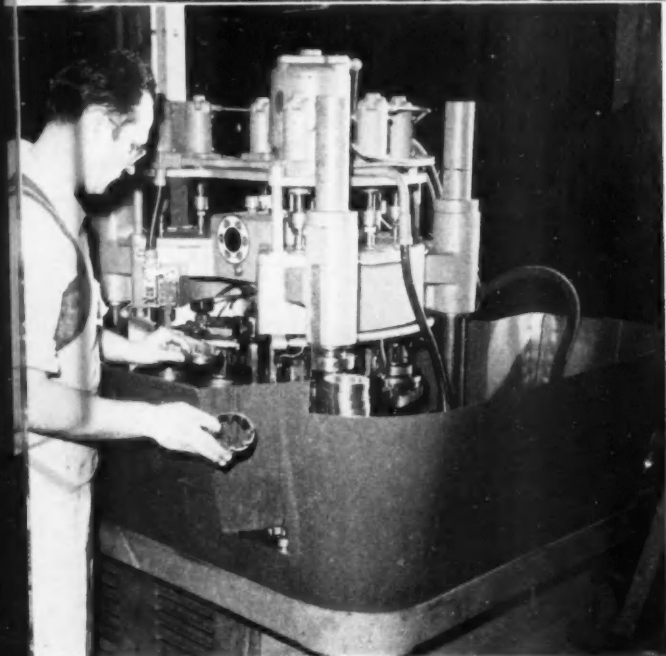
Significant

By

Joseph

Geschelin

First major sub-assembly for torque converters is found in the spot-welding of blades to torus rings. One of the hydraulic multi-spot welders designed for this purpose is seen in this close-up.



Most cam lobes are finished by honing in the special ten-station honing machine shown here.

INCIDENT to the adoption of the 180-hp V-8 engine on Chrysler New Yorker and Imperial cars was the introduction of the four-element torque converter which is installed on V-8's in conjunction with the improved M-6 transmission. Manufacture of the torque converter has been accommodated by an expansion of the present facilities for making the Chrysler fluid coupling.

As shown in the cross-section of the torque converter, the assembly is composed essentially of the impeller and turbine, which are fabricated of steel stampings; the two stator or reaction members of aluminum castings; and the aluminum support plate which houses the fluid pump.

Equipment for producing the torque converter represents many new and special pieces of machinery of advanced type capable of a high order of precision and excellent surface finish. There are a large number of precision boring machines, angular wheel-head grinders of latest type, a variety of automatic lathes, and other equipment of outstanding merit. The press shop abounds in heavy

Operations on the Chrysler Torque Converter

presses of latest design, and includes several enormous 2500-ton hydraulic presses for restriking operations. Just installed are two large hydrogen brazing furnaces, fitted with automatic loading conveyors, which are used for brazing as well as bright annealing of most of the stampings.

Welding operations of unique character are widely employed. Multispot resistance welding machines handle the spot welding of blades to the torus rings; while specially-designed submerged arc process welders, welding under heavy flux, are employed for seam welding, including the welding of the assembled unit.

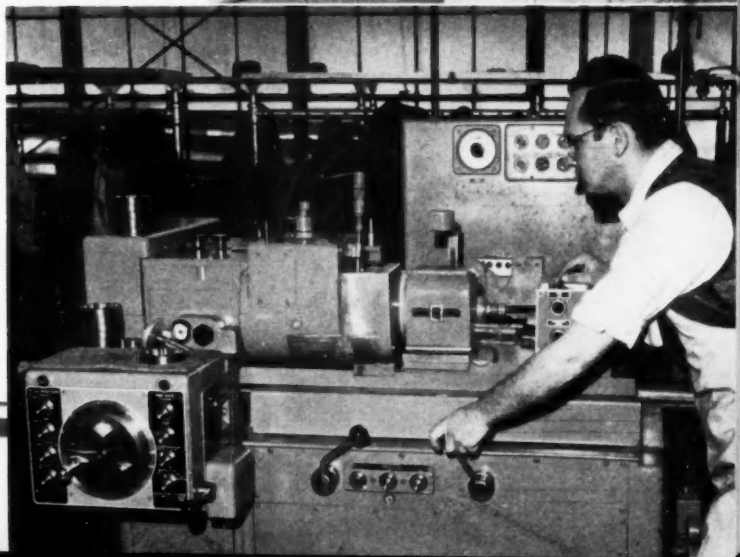
Considering the wealth of detail involved in an operation of this magnitude, this article will be confined to a pictorial high-spotting of selected operations.

Starting with several of the stampings made for this unit, the smallest elements—the blades—are produced in latest models of well known high speed dieing machines, fitted with seven-station progressive dies which complete the blanking and complex formation in one cycle. Only two types of blades are required—one for the turbine, the other for the impeller. The impeller takes 37 blades while the turbine has 35.

Like most of the other stampings, the blades are given an annealing treatment in the new electric hydrogen atmosphere fur-

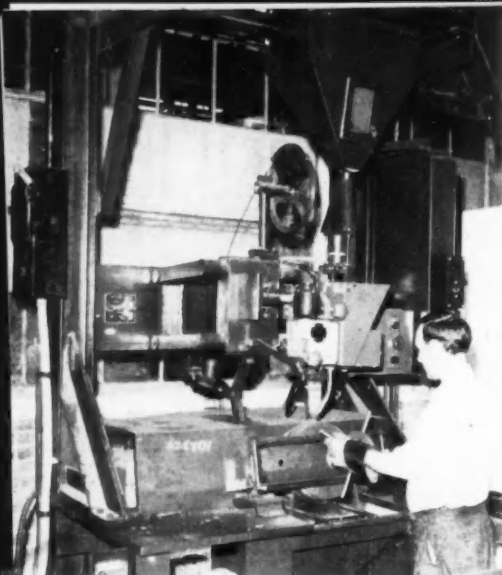


The clutch driving plate, with two tapped bolt circles, is drilled and tapped in this special machine which is provided with five working stations and one for loading.



Cam lobes requiring considerable stock removal are finish-ground individually in this internal grinder.

Significant Operations



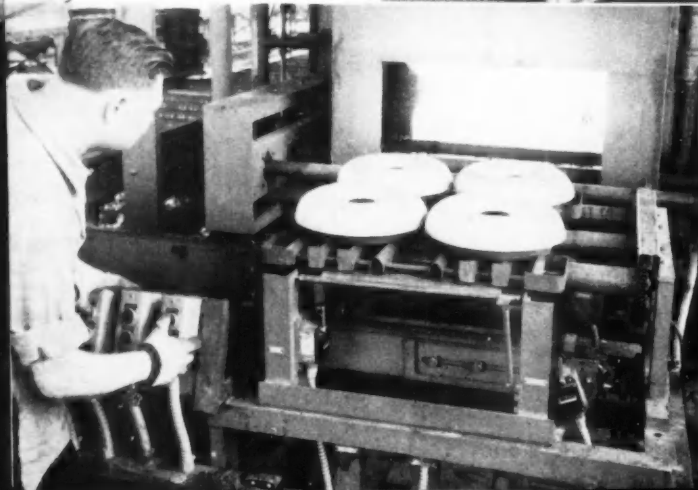
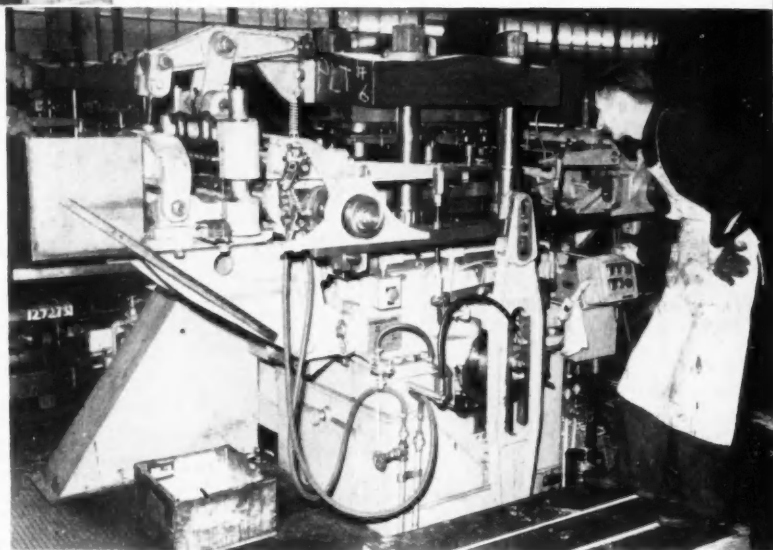
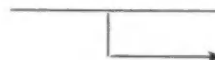
naces which are also used for hydrogen brazing. Following annealing the blades are given a restrike in the small press shown here. As illustrated, the press is fitted with an 8-station indexing table, the blades being placed on special work-holding fixtures by the operator. As the cycle is initiated, the magnetic hand of the Feed-O-Matic mechanism picks up the blade and inserts it into the press die for restriking. At the completion of the press stroke the blade is ejected by air blast.

Larger stampings such as the impeller and turbine housing, for example, are annealed after stamping, then given a restrike in one of the huge 2500-ton



Assembled torque converters are seam-welded into a sealed unit in this submerged arc welding machine.

Here is a close-up of one of the new high-speed dieing machines for producing turbine blades. Each of the machines is fitted with a multiple-station progressive die.



← This is the loading station of one of the large hydrogen brazing furnaces.

on the Chrysler Torque Converter

hydraulic presses illustrated here. It is of interest that hydraulic presses were selected for this purpose because of the extremely heavy coin which demands high pressure coupled with a smooth, slow application of pressure.

A few examples of machining equipment will suffice to indicate the nature of the work done in this plant. The clutch driving plate requires the drilling and tapping of holes in two circles, this being done in a special machine built for the purpose. As shown, it has six stations on an indexing table, five working stations, one loading.

The large aluminum support plate is machined in a precision-boring type unit, handling the facing of the large-diameter pilot, and counterboring and boring of the center bore. The bore is held to a tolerance of 0.001 in. Pilot facing requires great care, the surface being held within 0.002 in. indicator reading for run-out with respect to the horizontal axis.

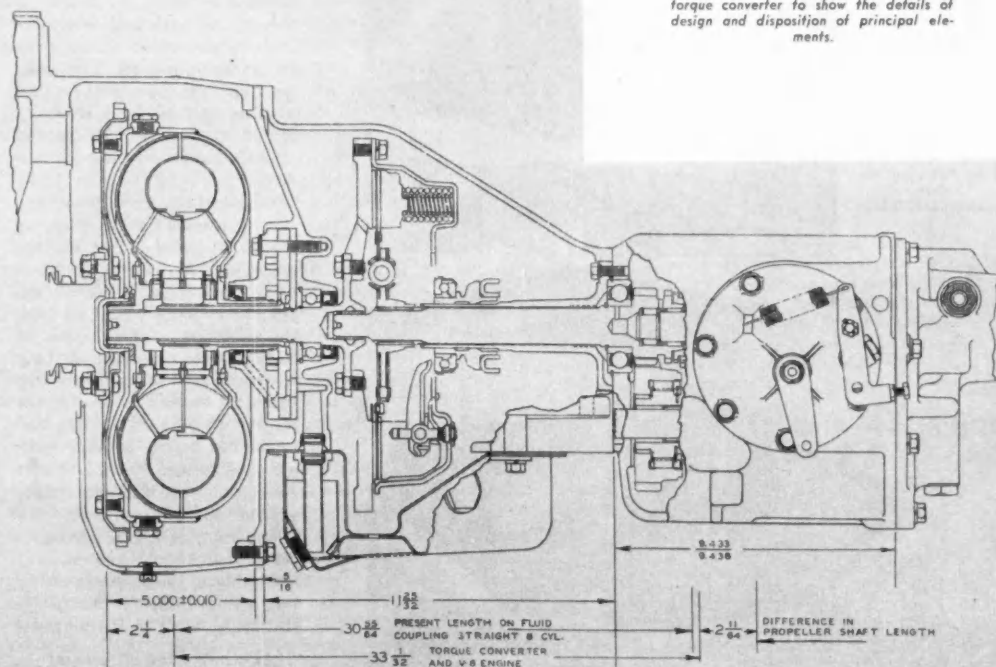
Hub sleeves, which carry the overrunning clutches for the stator elements, entail a series of operations held to close tolerances. These sleeves contain eight

equally spaced cam pockets of contoured form. After these surfaces are hardened, they are ground or honed to form with the following characteristics—smoothly honed surfaces, parallel with the horizontal surface within 0.0002 in., runout held within 0.001 total indicator reading, and concentricity with the bore within 0.001 in. total indicator reading.

Work blanks are prepared initially by machining in a battery of new automatics, then the internal configuration is finished accurately to size in a vertical broaching machine. Following machining the parts are given a salt bath heat treatment. Then the cam surfaces are selectively hardened in the special flame hardening machine shown here.

As mentioned above the cam surfaces in the hub sleeves require meticulous finishing. Two different methods of finishing are being employed at the start of production. In the first place, all of the parts are graded for size in a new electronic inspection machine which grades according to tolerances on each cam surface after flame hardening. Such parts as may require an appreciable amount of metal removal then

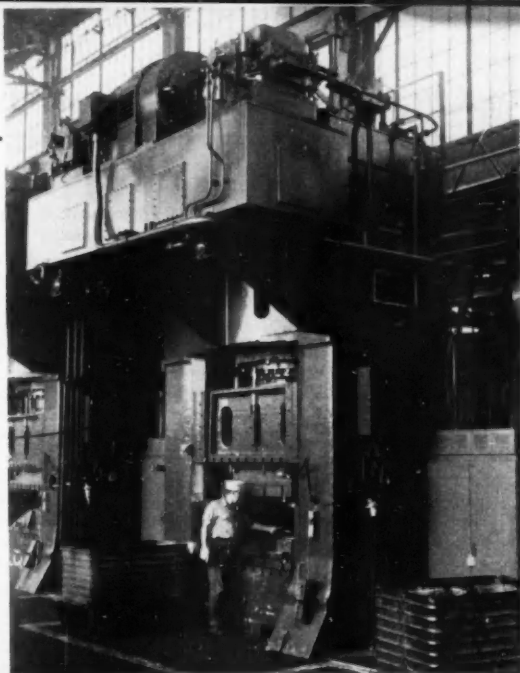
Here is a cross-section of the Chrysler torque converter to show the details of design and disposition of principal elements.



Chrysler Torque Converter

are routed to a special internal grinder in which each cam surface is finished to size and form within the specified tolerances. In this setup the cams are ground one at a time, the part being indexed radially by the fixture while the grinding spindle is reciprocating.

The majority of parts, however, are finished in the special honing machine illustrated here. As shown, the machine has a rotary indexing table holding ten rigid fixtures. Rigidly-mounted single-stone honing tools, one for each cam surface, are mounted in a common head and are so positioned that each one hones a different surface from its own center and generates a true radius. The head is stroked and the tool oscillated mechanically, the motions being so adjusted as to give full coverage of the bearing surface. The combination of



This is the 2500-ton hydraulic press used for coining the larger stampings for the torque converter.

Restriking of blades, after annealing, is done in this press. The work is placed on fixtures on the rotary indexing table and automatically picked off by the magnetic hand which feeds the blade onto the die.

The cam lobes of the small hub sleeves are selectively hardened in this automatic flame hardening machine.

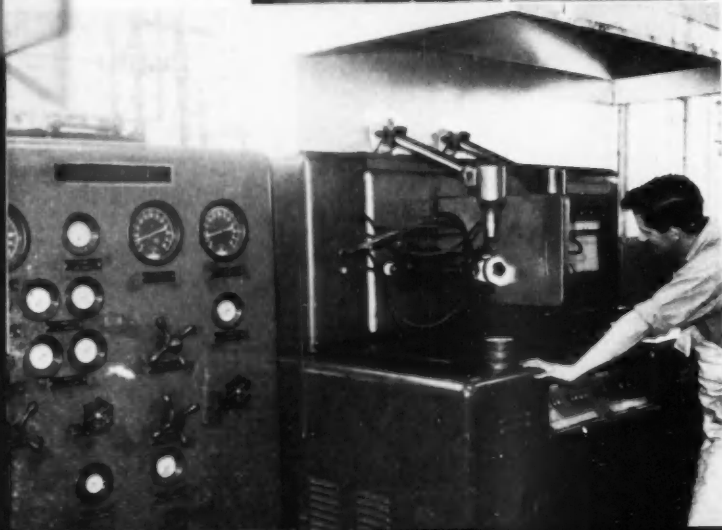


motions of the hone breaks up the cutting path and develops a cross-hatch pattern that keeps the abrasive dressed. Two index positions are provided for unloading, loading, and checking. Approximately 0.0002 in. of stock is removed from each surface.

Outstanding performance on several operations has been recorded with the use of angular wheel-head grinders of latest type. One of the noteworthy applications of this technique is on the finishing of both sides of turbine hubs. Here they have the problem of finishing the hub extension as well as the face of the web on both sides. Each side is finished in one setting, using a special formed wheel. Not only does this produce accurately ground surfaces, held to fine tolerances, but surface finish is better than 10-microinches.

Coming to the assembly of the torque converter, the initial operation is found in the prepara-

(Turn to page 88, please)



METALS

*Refined Copper Sales Reported at 100,000 Tons
for March; Tin Under Complete Federal Control*

By William F. Boericke

SALES of refined copper by producers for March delivery were reported at 100,000 tons on March 15. This compares with 99,600 tons delivered to domestic fabricators in February and a monthly average of 114,400 tons in 1950. Demand for copper continues very strong with prices abroad higher than the 24½ cents a pound in effect for the domestic market.

Statistics released by the Copper Institute for February reveal that the daily rate of domestic mine production was the highest since 1943. At the same time secondary production fell to only 3900 tons in the month. Copper scrap is scarce and thus far deliveries to primary smelters have failed to show that the ban on conversion deals ordered by NPA has had much effect. Normally upwards of 10,000 tons a month of copper scrap should go to the custom smelters.

The fabricators' statistics suggest there was some overbuying by consumers late in 1950 with the possibility that their inventory position may not be quite as tight as is generally declared. The backlog of the fabricators' unfilled orders dropped 32,000 tons in January and new business booked in January was off 20,000 tons since December.

NPA announced second quarter restrictions on use of copper by fabricators at 75 per cent of the average quarterly use in the base period (first half of 1950) under an order M-12 issued March 11. In the first quarter consumers used about 7 per cent more copper than the permitted rate, no doubt because they were trying to beat the deadline effective March 1st banning use of copper in some 300 so-called non-essential products. NPA has endeavored to draw a distinction between fabricators and assemblers of copper. The latter are not subject to restriction. Their job will be to line up fabricators who can supply them with extra copper. This won't be easy.

However, if a copper consumer wants to pay the price, he can get some copper from abroad. An offer of 5000 tons of semi-fabricated copper from Chile has been made to New York metal traders. The price is 41 cents a pound, with no takers thus far. The Chilean government is agitating for a higher price than 24½ cents for its copper. A price of 28 cents might be satisfactory if the import duty of 2 cents a pound were repealed. U. S. officials are said to be receptive providing Chilean production would be increased.

Lead Imports Drop

NPA has directed that a 60-day limit be placed on consumers inventories but this hasn't eased insistent buying to any extent. It's generally believed that consumers' inventories of lead are closer to 30 days than 60 days' supply of lead and users are anxious to reach the top bracket. As the foreign lead price is more than the domestic price of 17 cents a pound, consumers are a bit fearful that the market may advance accordingly. Export business is priced at 19 cents a pound and upwards, f.a.s. Gulf ports.

Stocks of refined lead in the hands of refiners totalled only 33,332 tons at the end of January. This was less than half the tonnage held a year earlier. Since April, 1950, refiners' stocks have declined every month.

January lead imports fell precipitately to 11,188 tons against 50,274 tons in December. This resulted from doubling the lead tariff to 2½ cents a pound. Lead imports normally provide about 40 per cent of the total available domestic supply and a continued loss of foreign metal is certain to strengthen the market. Lead is the only major metal that is now selling at less than its postwar peak.

As the Government has not been stockpiling lead for more than eight months and present demand arises almost wholly from industrial demand, the industry can afford to remain unconcerned over announcement

(Turn to page 72, please)

WITH the metals supply becoming more and more critical, AUTOMOTIVE INDUSTRIES has obtained Mr. Boericke to make a monthly analysis of the metals market, which will be surveyed for significant changes and trends. He is well-known in the mining and metal industries, having been associated with them for the past 20 years in important capacities and has done considerable technical writing, including frequent articles for Barron's and the New York Stock Exchange magazine. Now a Mining Consultant for Hayden, Stone & Co. in New York City, his former positions were senior Mining Analyst for the Securities and Exchange Commission in Washington, Chief Valuation Engineer for the Philippine Bureau of Mines, and Metal Consultant for the War Assets Corp. At present Mr. Boericke also is a lecturer for the New York Institute of Finance.

Canberra Twin-Jet Bomber to

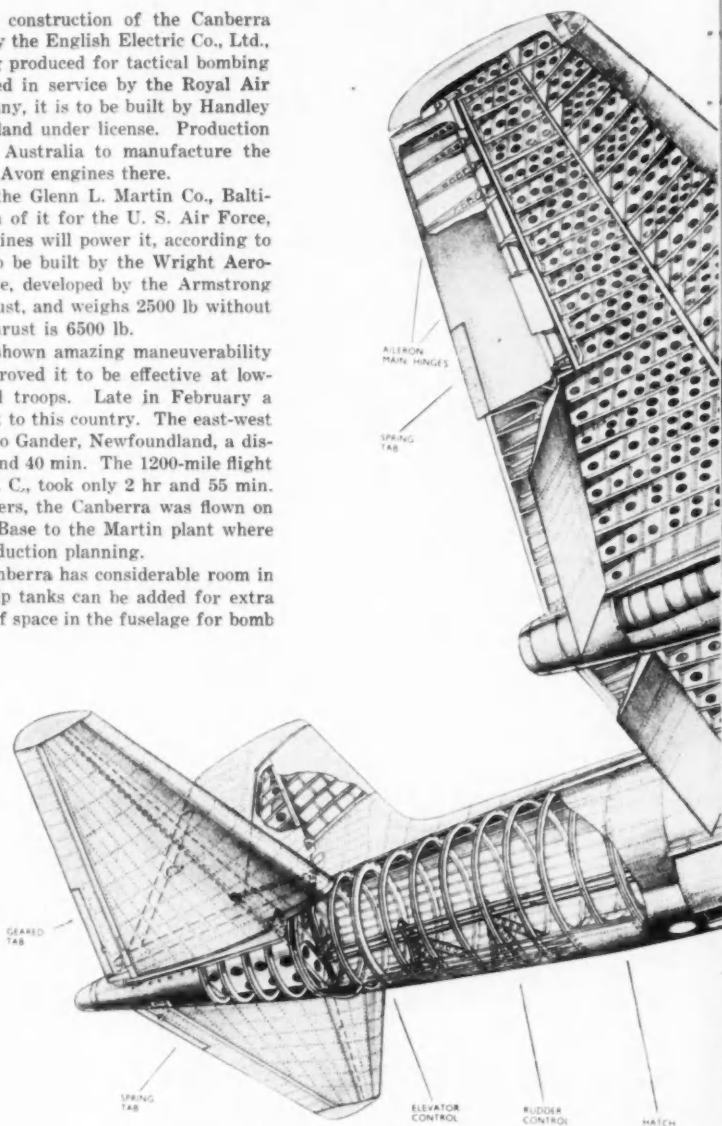
THIS cutaway drawing shows the construction of the Canberra light twin-jet bomber, developed by the English Electric Co., Ltd., of England, where it is now being produced for tactical bombing and is the first jet bomber to be placed in service by the Royal Air Force. In addition to the parent company, it is to be built by Handley Page, A. V. Roe, Short Bros. and Harland under license. Production facilities also are being organized in Australia to manufacture the Canberra airframe and its Rolls-Royce Avon engines there.

Plans are being made here to have the Glenn L. Martin Co., Baltimore, produce a night intruder version of it for the U. S. Air Force, but instead of Avons, Sapphire jet engines will power it, according to reliable sources. The Sapphires are to be built by the Wright Aeronautical Corp. This gas turbine engine, developed by the Armstrong Siddeley of England, has a 7200 lb thrust, and weighs 2500 lb without component parts. The latest Avon's thrust is 6500 lb.

In demonstrations this bomber has shown amazing maneuverability at high speeds and test flights have proved it to be effective at low-level operations in support of ground troops. Late in February a Canberra made a record-breaking flight to this country. The east-west crossing from Belfast, North Ireland, to Gander, Newfoundland, a distance of 2100 miles, was made in 4 hr and 40 min. The 1200-mile flight from Newfoundland to Washington, D. C., took only 2 hr and 55 min. After an inspection by top USAF officers, the Canberra was flown on March 5 from the Langley Air Force Base to the Martin plant where it is being studied to speed up pre-production planning.

Although unusually compact, the Canberra has considerable room in its fuselage for fuel tanks and wing-tip tanks can be added for extra long flights. Likewise, there is plenty of space in the fuselage for bomb storage. Accommodations are provided for a crew of three who are seated in a pressurized cabin on ejection seats. Outboard of the nacelles are "finger" type brakes for slowing down the plane during a dive without requiring additional trim by the pilot.

Top procurement officers of the USAF and Martin officials attended the formal ceremony in England on Jan. 19 when the bomber was named Canberra, for the capital of Australia. Heading the group was Lt. Gen. K. B. Wolfe, Deputy Air Chief of Staff for Materiel, and from the Martin company were C. C. Pearson, president and general manager; G. T. Willey, vice president manufacturing and assistant general manager; M. E. Hogan, patent counsel; and Robert Williams of the Martin engineering division. Arrangements were made at that time for the flight here.



This copyrighted drawing reproduced by special permission of Flight (London)

be Built by Three Nations

Dimensions

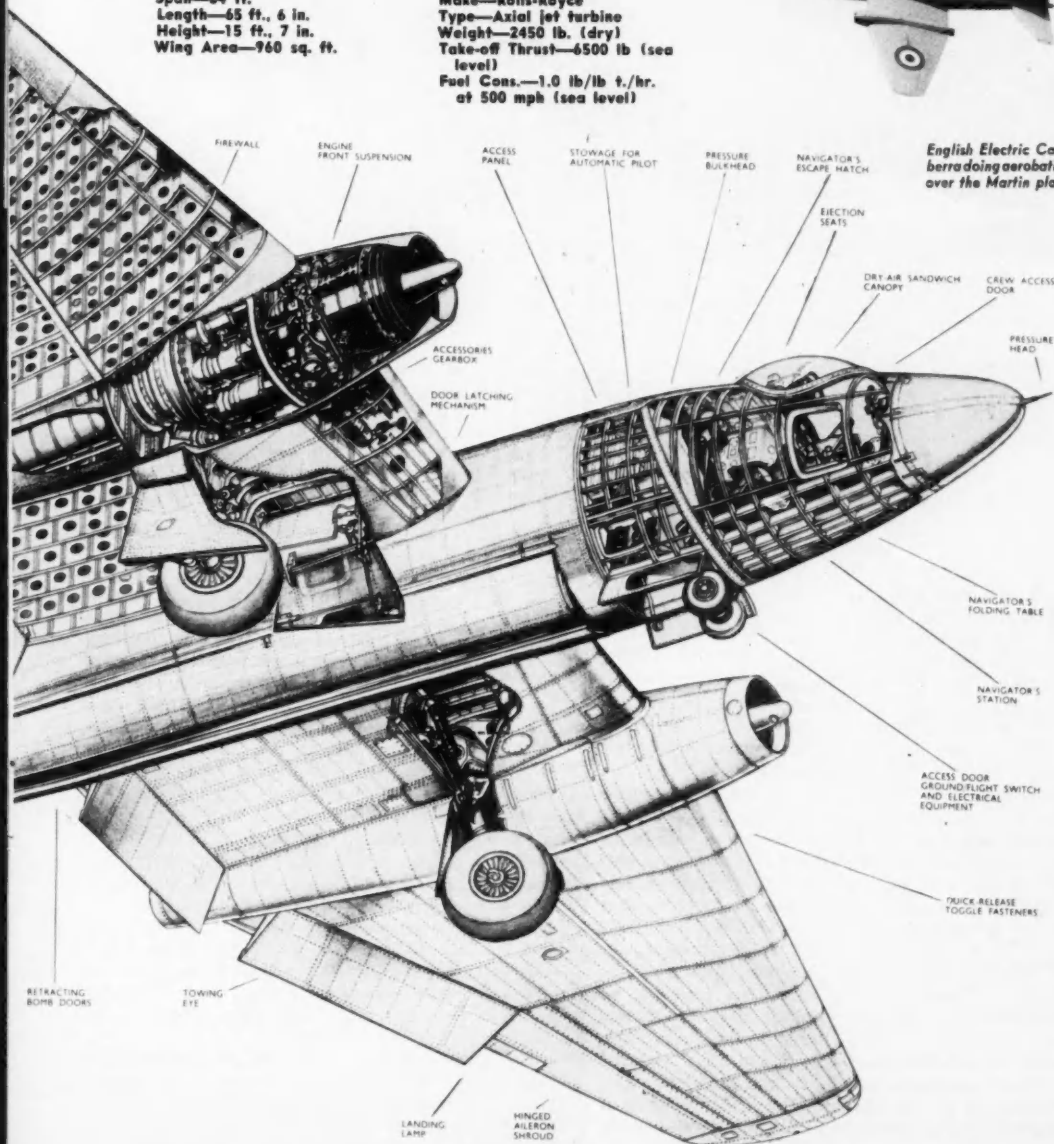
Span—64 ft.
Length—65 ft., 6 in.
Height—15 ft., 7 in.
Wing Area—960 sq. ft.

Engine Data

Make—Rolls-Royce
Type—Axial jet turbine
Weight—2450 lb. (dry)
Take-off Thrust—6500 lb. (sea level)
Fuel Cons.—1.0 lb/lb $\frac{1}{2}$ /hr. at 500 mph (sea level)



English Electric Canberra doing aerobatics over the Martin plant





Portion of the planning group at Douglas.

Production Planning Boosts Department Efficiencies

PRODUCTION planning at the Douglas El Segundo plant has developed over the past several weeks into a department combining both tool and production planning functions. At current operational levels this has resulted in increased efficiencies for the engineering, tooling and manufacturing departments.

The planner at Douglas must work in close coordination with the engineering department so that he may develop concurrently, during the stages of initial design, the basic planning information which will permit release to the manufacturing department on completion from engineering. The planner is responsible for the ordering of parts involved whether internally fabricated or purchased through outside sources in the building of the airframe. He must determine the sequence of manufacturing operations, including all processes and inspections; establish shop departments and facilities necessary; interpret schedule requirements of each fabricated detail; and order material and parts as required and in the quantities necessary. The planner is held responsible for determination of sequence in which operations will be performed in the

By C. R. Wulffsohn

Ass't. Superintendent,
Planning and Tool Design, Douglas Aircraft Co.

process of fabrication which must be consistent with the best interest of manufacturing economy, technique and facilities. He must bear in mind the requirements of engineering specifications and tolerances to the extent that cost,

quality and interchangeability are factors of influence in the choice of tools and methods to be employed. The planner is responsible for working in conjunction with manufacturing, schedules, and time standards departments to establish production line positions and sequence of installations within those positions, including the balancing of labor hours which will insure smooth line movement and economy of operation. He must function in close coordination with tool designers and tool engineers to provide and obtain the necessary information relative to their activities. He must order all tooling required for fabrication and assembly which must be closely coordinated for consistency between tools, method and facilities.

To fulfill adequately this brief description of responsibility, requires the efforts of men of top mental calibre, training and experience and demands a thor-

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Making the Cadillac Front Bumper and Guard Assembly

Front bumper guards are drawn in halves and welded together in the fixture seen here. The halves are clamped within the cupped holding jaws on each side, then welded with an argon gas shielded electrode.



This view shows the six individual pieces that comprise a Cadillac bumper. It also indicates clearly the several attachments welded into the individual sections to facilitate assembly operations.



A completed bumper assembly, including mounting brackets is shown here.

THAT handsome, massive front bumper on 1951 Cadillac cars is actually an integral assembly of six different parts, joined on the bumper assembly line after electroplating. It is comprised of two outer sections, two center sections, and the two bumper guards. The center section, however, is made up as a riveted sub-assembly just before the start of final assembly.

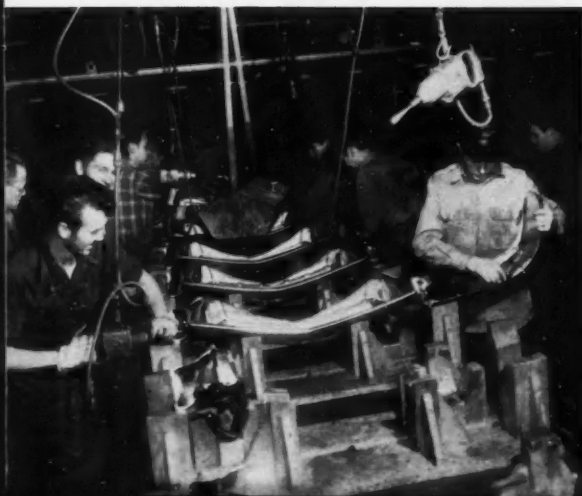
All of the individual sections are drawn from N-A-X steel, 0.120 in. thick. As an example of the press setup, consider the making of outer sections. In the main, these stampings are blanked, drawn, and trimmed.

The outer end of the stamping is given a restrike, the stamping flanged for attachment, and the attachment holes pierced. The presses are equipped with multiple die stations, enabling the operators to load rights on one side of the presses, lefts on the other.

In view of the heavy draw required for bumper parts, drawing and restrike are done in 1000-ton Clearing presses. A 200-ton Minster press installed between these operations handles trim operations.

The big, inclined front bumper guards are drawn in halves, rights and lefts being handled in multiple dies in the same press. Later on the halves are joined into an integral part by

(Turn to page 83, please)



Perspective view of the short mechanized conveyor on which Cadillac front bumpers are assembled.

Torsional Vibrations Minimized In Reverse and Reduction Gears

THREE new marine reverse and reduction gears were announced recently by Twin Disc Clutch Co. of Racine, Wisc. Model MGH-340, equipped with a fluid coupling, is for engines in the 300-350 hp class. The other new units, Models MG-175 and MG-302, transmit engine torque through rubber in compression to cushion the drive. The gears are extremely compact—20 in. overall with rubber block for the MG-175 and 40 in. for the MG-302. Compactness has been achieved through re-design of the gear train, utilizing hydraulic instead of mechanical clutch actuation, and use of lighter and stronger gears, which are carburized and hardened, with generated helical ground tooth profile.

The rubber-in-compression drive consists of a gear tooth driving spider driven by an internal gear ring bolted to the engine flywheel. Synthetic rubber caps are molded to the profile of the machine-cut teeth on the spider periphery. The combination is said to reduce to a minimum the transmission of both shock and noise, and to withstand reasonable axial and eccentric misalignment without putting undue stress and load on the marine gear input shaft and related parts.

Like all new Twin Disc gears, the new MG-175 and MG-302 are provided with a power take-off shaft for operating auxiliary equipment. On the smaller gear it extends through the rear of the case; on the larger unit it is a separate gear-driven shaft with separate built-in, wet-type clutch.

The method of reversing propeller rotation is the same countershaft design that Twin Disc has made standard. One clutch directs the power flow, through a pinion and gear for forward direction, while an identical clutch is used to transmit the power through a pinion, an idler and a gear for reverse direction. Oil acting upon a piston provides the clutch clamping force. The

clutches have driving plates faced with sintered, bonded, bimetallic friction material. Spring loading of the hydraulic operating valve enables the operator to readily sense the forward, neutral and reverse positions.

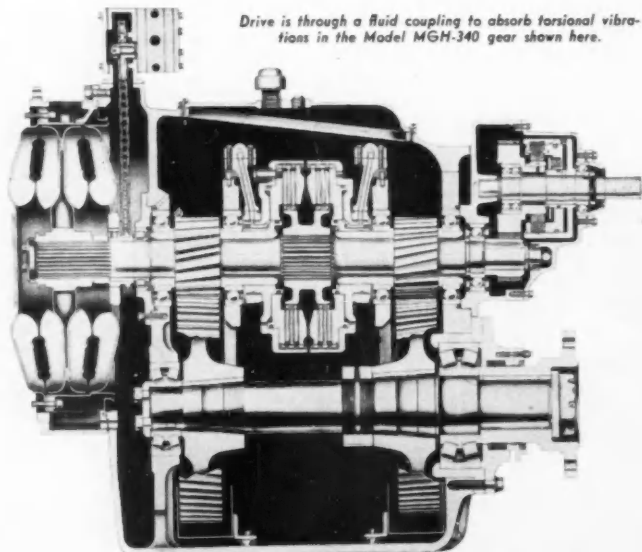
The hydraulic wet sump system is independent of the engine oil system. Each unit has its own gear-type pump, driven at all times at engine speed, insuring a positive flow of oil even at idling speeds. Each also has a relief valve, actuating valve, and filter. All moving parts in the gear are thoroughly lubricated by the splash oil system, while caged roller bearings under the pinions are pressure lubricated.

Model MGH-340, designed for engines in the 300-350 hp class, has hydraulically actuated clutches in addition to a fluid coupling drive. Either a 21 in. or 27 in. hydraulic coupling is available on the MGH-340.

With a 21 in. hydraulic coupling it can be equipped with a new slow speed Hydro-Troll drive which, at low trolling boat speeds, permits the engine to turn

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Drive is through a fluid coupling to absorb torsional vibrations in the Model MGH-340 gear shown here.





Distinctive of the 1951 Oldsmobile Super 88 is the bright diagonal sash down the rear fender shoulder of its new Fisher body as shown here on the deluxe four-door sedan

Super 88 Features New Body and Leaf-Type Rear Suspension

LATEST addition to Oldsmobile's 1951 line, the Super 88, features a brand new, wider and roomier Fisher body, an improved high compression Rocket engine, and a new suspension system. Five deluxe body styles are offered on the Super 88 120-in. wheelbase chassis. They are the Holiday coupe, club coupe, convertible coupe, two-door sedan and four-door sedan. Overall length is 204 in. Thirteen body colors and ten two-tone paint combinations are available.

The new model is readily identified by a distinctive decorative sash that extends from the shoulder of the rear fender diagonally down the fender to the gravel shield. The front fender crown lines extend along the body to the shoulder of the rear fender, at the point where the diagonal sash begins. There the body line slopes upwards and then the rear fender crown flows downwards until it blends into the tail light assembly. Wide horizontal bars are retained in the front grille, with the lower bar extending through the two bumper guards. Rear vision is said to be improved by 50 per cent through a greater rear window area.

Interiors of sedans and coupes are fitted with two-tone nylon upholstery. The convertible is upholstered in leather. Front seats of all body types offer more than 60 in. of hip room; rear seats of closed models have 59½ to 64½ in.

New 58-in. leaf-type springs are employed at the rear suspension while coil-type springs are continued for the front suspension. This is the same system introduced on the 1951 Series 98. Also contributing to rider comfort are foam rubber seat cushions which are standard on all models.

Compression ratio of the 135-hp Rocket engine has been increased to 7.5 to 1. The combustion chamber has been redesigned to obtain better efficiency. This will capitalize on high compression advantages even if premium fuel octane numbers are lowered somewhat in the national emergency. However, Oldsmobile engineers still recommend the use of premium fuels for best performance.

Contributing to engine performance are a new down-draft carburetor with quicker starting and non-flooding characteristics, an improved distributor said to provide greater voltage, moisture-proof silicone rubber insulating sleeves for the spark plugs and a redesigned wiring harness. These improvements in the Rocket engine apply to all of Oldsmobile's 1951 line of cars.

Hydra-Matic drive, offered as optional equipment on all 1951 Oldsmobiles, has been improved through introduction of a new reverse control mechanism which permits finger-tip shifts between forward and reverse without delay. This facilitates rocking the car to and fro when on ice, snow, sand or mud.

Military Vehicle Problems Presented at SAE Meeting

Military Tactical Wheeled Vehicle Body Requirements

By Captain J. L. Quinnelly

U. S. Army, Ordnance Corps,
Detroit Arsenal

INITIALLY, a set of military vehicle characteristics is prepared by the using agency. These characteristics state in broad general terms what is expected of the vehicle and point out those features which are definitely required to make the vehicle suitable for military use. After circulation to other interested agencies to obtain their comments and/or concurrence, the characteristics are transmitted to the Ordnance Corps and specifications for the vehicle are prepared based on the military characteristics. Pilot models are produced and delivered to Aberdeen Proving Ground, and the using arm or service, for engineering and service tests, respectively. Based on the results of these tests, the design of the vehicle is finalized, and production is begun.

When plans were made to procure replacement vehicles for what we in the service term the tactical fleet, i.e., the group of all-wheel drive military vehicles used in, or in close support of, military operations in the field, considerable thought and study was given to the problem of keeping the various types of vehicles to a minimum. It was decided that the best method of accomplishing that end was the establishment of basic chassis within each weight class of vehicles. By weight class I mean the nominal, military-rated or cross-country payload. These basic chassis would incorporate those features which would permit their acceptance of the maximum number of body types. The policy of designing bodies around a basic chassis is being applied not only to trucks, but to trailers and semitrailers as well.

One of the principal problems faced by the body designer of military vehicles is dimensional limitations. In these days of airlifts and seaborne invasions at a moment's notice, the overall dimensions, particularly the height and width, of many wheeled vehicles are limited by the door size of the plane, or the ramp opening of the landing barge in which these vehicles may be transported.

The question of materials is always a thorny one. It is highly desirable to reduce weight to a minimum for the sake of air transportability. However, in a national emergency, wheeled vehicles are not on a priority list for light-weight metals and, in fact, have trouble in securing ample steel. Therefore, the basic

cargo body designs for trucks are of steel construction. Based on the experience gained in World War II, the manufacturers of cargo bodies must be capable of switching to wood construction for the floor in the event sufficient steel for the all-steel construction becomes unobtainable.

Then there is the extremely severe climatic requirement that the equipment be capable of operation in the temperature range from -65 F to 125 F.

Appearance is important, not in terms of distinctive styling, but on the contrary, it is desired that Army vehicles, in particular those used for command purposes, do not have a distinctive silhouette.

Another postwar requirement receiving increased attention, is ease of maintenance. This affects body design through such features as the requirement that the hood be hinged at the rear in order to provide better accessibility to the engine compartment with lifting devices employed during power plant removal. The grille must be hinged to fold forward on some types for the same reason.

At present the military requirements are for both hard and soft-top cabs, except in the case of the field ambulance which has the cab integral with the body. Present designs are utilizing a "convertible" type construction, i.e., the doors and windows are furnished with the soft-top version, and a metal top merely replaces the canvas one. Windshields are required to be of a type which folds forward, thus making the overall height reducible to the top of the steering wheel. It is also desirable that the windshield be placed vertically so as to eliminate light reflection and detection from the air.

The interior of the cab must be free of any sharp corners, edges, or projections which would be likely to cause injury to operating personnel. All controls must be capable of operation by personnel wearing heavy winter clothing.

Materials of Military Motorized Equipment

By Col. Benjamin S. Mesick

Chief, Research and Materials Branch
Ordnance Corps

STEEL, the predominant material of Ordnance construction, is used in many types, classes, grades and combinations of physical properties. Ordnance has applications identical with or closely paralleling those of the entire automotive industries. Armor for
(Turn to page 94, please)

THE 1951 SAE National Passenger Car, Body, and Materials Meeting concluded in Detroit last month, well attended with a registration of over 750, had the flavor of meetings held during the past war despite a predominance of objectively technical papers on vehicle design and operation.

Climax of the meeting was the address of Harry J. Klingler, vice president, General Motors Corp., keynoting the importance of the engineer in the management scheme. Of major significance was his statement that the motor car industry never did succeed in fulfilling the postwar demand for transportation and further that if production were to come to a halt in the future, the latent demand would pyramid unsatisfied requirements to a fantastic degree.

Captain J. L. Quinnelly described the development of military vehicles, particularly in regard to body requirements. He pointed out the fact that the best method of keeping various types of vehicles at a minimum was the establishment of basic chassis within each weight class of vehicles. These basic chassis would incorporate features which would permit their acceptance of the maximum number of body types.

Faced with a confused and clouded picture of materials, industry already is plagued with a

rash of sideline market deals shaded from gray to black, adding up at present to a dangerous situation from the standpoint of critical materials required in making cars and trucks for civilian consumption. Added to warnings from other directions, studies of the availability of ferrous and non-ferrous materials presented by E. C. Smith, Republic Steel Corp., and R. J. Lund, Battelle Memorial Institute, indicated that in many cases supply is inadequate even for peacetime demand because of short-sighted governmental policies of legislation and taxation that have discouraged the development of new sources of supply.

Another slant on the materials problem came from Col. B. S. Mesick who asked for industry cooperation in developing suitable materials for the Armed Forces. Smith mentioned in his paper that titanium alloys are about the only ones available in sufficient quantity to meet all demands. Because of this, Col. Mesick stated that Ordnance is considering the use of titanium alloys as a substitute for steel armor, with the prospect of reducing weight by some 40 per cent.

Abstracts of some of the most significant papers presented at this meeting give a quick perspective of current developments and the course of research programs.

The Lashograph— An Instrument for Observing Valve Lash in a Running Engine

By E. B. Etchells

Chevrolet Motor Div. General Motors Corp.

ALTHOUGH the Lashometer, a mechanical-optical device which has been used at the GM Research Lab for many years to measure valve lash, provided fairly accurate results, there were several major deficiencies in the instrument, chief among them being excessive vibration, which made readings very difficult at 3000 rpm and over. It was troublesome to adjust, too since any extra friction would cause errors in the readings. It was also noticed that, at speeds over 1800 rpm, an oil fog on the mirror greatly reduced the intensity of the light beam, making reading more difficult.

It was with the above problems in mind that the Chevrolet Engineering Department undertook the development of the instrument which has since become known as the Chevrolet Lashograph. This device indicates operating valve lash with high accuracy at speeds as high as 4000 rpm. Basic parts of the Lashograph are shown in Fig. 1. The plunger bushing screws into the rocker arm in place of the regular adjusting screw, and the round end of the plunger fits into the

conventional push rod. The cam is held against the plunger at A by the action of the torsion spring, and the attached mirror assumes an angle that depends on the valve lash. The light beam is reflected from the mirror to the screen as in the earlier model, and

(Turn to page 92, please)

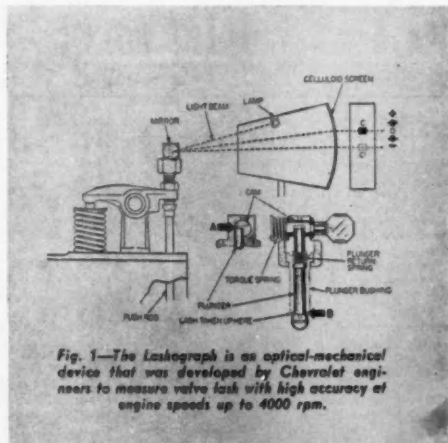


Fig. 1—The Lashograph is an optical-mechanical device that was developed by Chevrolet engineers to measure valve lash with high accuracy at engine speeds up to 4000 rpm.

How Tool Life is Affected by Heat Resisting Alloys

DEVELOPMENT of the turbine, which is so very simple in theory, has been held up for centuries pending the creation of alloys possessing strength and corrosion resistance to withstand the forces and chemical attack of hot, burning gases, in order to make the gas turbine, the turbosupercharger and the turbojet engine a practical reality. Now, with comparative suddenness, there is a demand for jet engines and turbines, and the problem has become one of economics and production.

For many applications, gas turbines will always be custom-made machines, but in order to power automobiles and aircraft in large numbers, they must be mass-produced cheaply.

The buckets are the most difficult parts in the turbine to manufacture because in order to stand up under high forces, and chemical attack at high temperatures, they must be fabricated from alloys which are extremely difficult to machine. Factors which impart the desired qualities of high-temperature strength and corrosion resistance also increase the alloy's shear

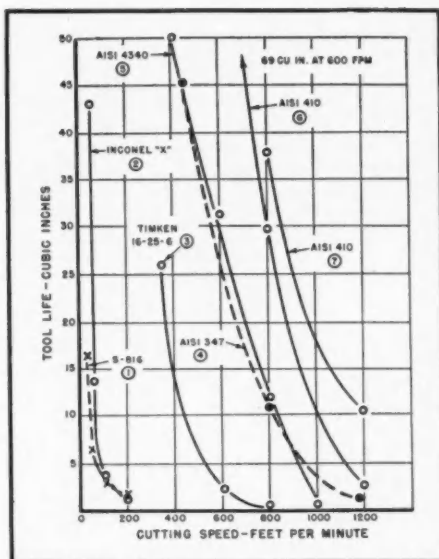


Fig. 1—Comparative cutting speeds for 30 cu. in. tool life of 0.008 wear.

1. S-816	sol. treated	35fpm
2 Inconel "X"	sol. treated	30fpm
3 16-25-6	stress rel'd	350fpm
4 AISI 347	annealed	350fpm
5 AISI 4340	300 Brinell	600fpm
6 AISI 410	306 Brinell	800fpm
7 AISI 410	204 Brinell	850fpm

Feed per rev: .009-.011 in.; 1 and 2, K6 carbide; 3-7, K3M carbide; same tool angles all tests; no cutting fluid.

strength in cutting and other properties influencing the machinability of the alloy.

Present production manufacturing methods are very expensive. Most of the turbine buckets are precision forged and the critical dimensions are finished by grinding alone because conventional machining with carbide cutting tools has been economically impractical.

The turbine disk itself as well as many other components must also be made from high-temperature alloys. Machining these alloys, in contrast to the bucket materials, is much simpler but still difficult when compared to alloy steels, even in the hardened condition.

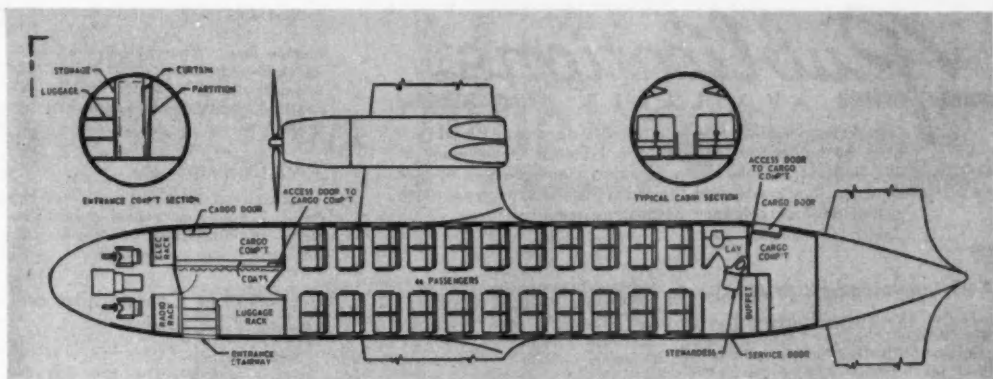
Most of the variables in the machining process have been found to be especially critical in the case of jet-engine alloys. Acceptable tool life and a fair production rate can now be attained, but microstructure, feed and speed and the exact tool material, must be selected carefully. Turbine-bucket alloys present the greatest machining problem. The turbine rim or disk alloy is about midway in machining difficulty between the bucket materials and conventional stainless steels.

Dynamometer cutting tests have brought out three major reasons for the difficulty in machining these alloys: (1) They exhibit extremely

(Turn to page 80, please)

Physical and Machining Properties of Temperature and Corrosion Resistant Alloys

	BRIEL HARDNESS	WATER EXPOSURE	CORROSION IN FRICION, AVG.	CUTTING SPEED	WEAR POWER, 100 CU. IN. MIN.	WEAR STRENGTH IN CUTTING, per 1000	70 °F.	1000 °F.	1500 °F.
S-816									
Annealed, 1950 °F.	297	2.23	0.68	100	1.21	132	...	...	...
Solution treated, 2250 °F.	250	2.28	0.65	100	1.16	130	...	...	...
Solution treated, 2150 °F.	269	2.34	0.62	100	1.22	138	...	...	...
Solution treated, aged, 2150, 1400 °F.	268	2.34	0.69	100	1.20	135	160	122	78
INCONEL "X"									
Solution treated, 2100 °F.	279	2.37	0.68	100	1.30	135	...	...	...
S. T. and aged, 2100, 1550, 1300 °F.	313	2.25	0.66	100	1.26	145	162	140	50
Equalized, 1625 °F.	265	2.21	0.72	100	1.27	135	...	...	...
Equalized, aged, 1625, 1300 °F.	332	2.37	0.68	100	1.38	147	...	...	...
TIMKEN 16-25-6									
Work hardened	318	2.09	0.61	200	1.18	130	148	95	45
Stress relieved, 1300 °F.	274	2.24	0.60	200	1.02	127	...	...	...
Solution treated, 2150 °F.	187	2.17	0.62	200	1.05	115	109	85	43
AISI 347									
Annealed	262	2.08	0.60	200	0.87	109	90	61.5	24
AISI 4340									
300 Brinell	300	2.20	0.68	200	0.94	111	150	...	...
AISI 410									
304 Brinell	304	2.22	0.69	200	0.92	97	89	44.5	9
303 Brinell	303	2.11	0.65	200	0.92	109	...	...	...
SAE 8640									
300 Brinell	302	2.15	0.67	200	0.93	109	150	...	...



General arrangement of Convair-Liner 340.

New Convair Transport

THE Convair-Liner 340, Consolidated Vultee's new 44-passenger, 45,000-lb-gross-weight, twin-engine transport, which supersedes the 240-A, includes and extends the improvements originally planned for that model. Although the 340 is based on the design of the Convair-Liner 240, it is largely a new airplane, having more wing area, a longer fuselage, a higher gross weight, more powerful engine, and many interior design improvements. The increased wing area, power, and fuel capacity, will enable airlines to employ the 340 not only for medium-range schedules but also as an alternate plane for four-engine equipment. In addition, the transport can be used for feeder-line operations.

Wingspan of the 340 is 105 ft eight in., compared

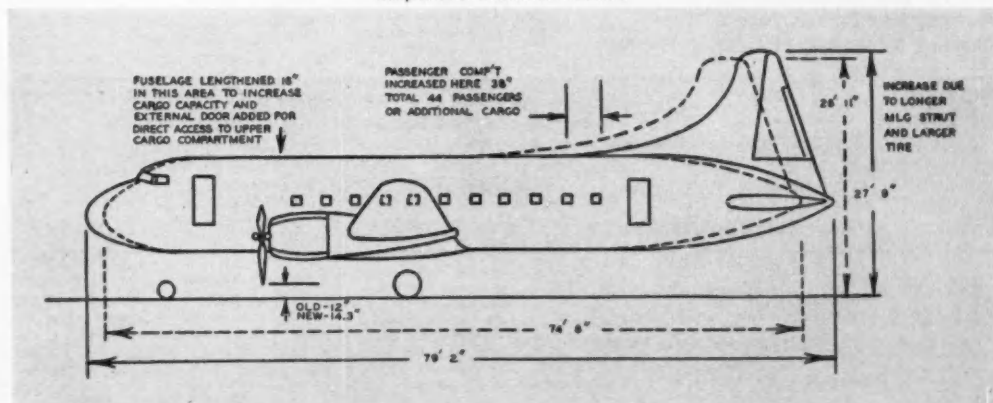
with 91 ft nine in. for the 240. Wing area is 920 sq ft compared with 817 sq ft in the 240 wing. The extra wing area, together with a new wing flap system, will reduce the required CAA takeoff field length by 1000 ft compared with the 240.

The 340 wing, with a greater area in newly designed panels outboard of engine nacelles, combined with an increased aspect ratio—12 compared with 10 on the 240—makes it possible to increase takeoff gross weight 3200 lb over the 41,790-lb gross weight of the 240.

An improvement in payload capacity and range over the 240 is made possible with the new wing. For the same range, the 340 can carry approximately 2000 lb more payload at higher cruising speeds. The 340 will

(Turn to page 102, please)

Comparison of Models 240 and 340.



Publications

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A-87 Laminated Plastics

Taylor Fibre Co.—Publication of a new 62-page catalog entitled, "Taylor Laminated Plastics," covers vulcanized fibre, phenol fibre and special laminates, design and machining hints, and the firm's engineering and research facilities.

A-88 Diesel Engines

Worthington Pump and Machinery Corp.—An 18-page bulletin No. S-500 B52A on a new line of DR Diesel engines has just been published by the firm.

A-89 Processing Machinery

Link-Belt Co.—The company has started distribution of its new 1296-page catalog. It contains 1673 tables and charts of basic data that simplify the problems of designing of conveyor systems, mechanical power transmission and many different types of processing machinery.

A primary function of the book, which is identified as Link-Belt General Catalog 900, is service as a reference tool. All available copies are being used to cover engineers, estimators and purchasing executives, in whose hands the information will be of greatest value.

A-90 Conveyors

Jervis B. Webb Co.—A new floor type conveyor catalog, No. 51, has been published. It contains 90 pages of information on conveyor chains, chain-on-flat and chain-on-edge floor conveyor with a variety of pusher dogs used in connection with them. Interested executives may obtain a copy by requesting it on their company letterheads.

A-91 Storage Batteries

The Electric Storage Battery Co.—"Exide Ironclad Batteries for Marine Service," a new catalog published by the firm tells in words and pictures the

performance and usefulness of this type of electric power supply in the marine field. The catalog consists of an eight-page information booklet and five data sheets, the latter listing specifications, interunit connectors and terminal lugs.

A-92 Cutting Tools

Continental Tool Works, Div. of Ex-Cell-O Corp.—Just published is a brochure that illustrates the various cutting tools made by the firm.

A-93 Rubber Conservation and Maintenance Plan

Quaker Rubber Corp. Div. H. K. Porter Co., Inc.—The firm has developed a "Conservation Maintenance Plan" which includes a handbook, wall charts, and monthly bulletins. This data contains hundreds of illustrations and suggestions on how to select, install and maintain conveyor belting, flat transmission belting, V-belts, hose and packing.

A-94 Carburetors

Holley Carburetor Co.—A new publication is now being offered by the company published every other month, the Holley Carbogram is sent to those interested in the servicing of Holley equipment, as well as all automotive personnel not directly connected with Holley to whom this information would be valuable.

(Turn to page 76, please)



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Cross special machine for operations on cylinder blocks.



B-43—Special Machine For Cylinder Blocks

On a new machine designed and built by the Cross Co., Detroit, Mich., one hundred cylinder blocks per hr are drilled, tapped, spot-faced and reamed. Only one unskilled operator is required. The machine is made up of 13 stations with parts automatically moving from station to station.

Operations include drilling, chamfering and tapping holes in the top and bottom; chamfering the cylinder bores, top and bottom; drilling oil holes from crank bearings to oil gallery; drilling, rough boring, semi-finish boring and spot-facing the distributor shaft hole; and drilling, chamfering, and reaming the dipstick hole.

Features incorporated in the machine consist of a cleaning unit situated at station 11, which vibrates and rotates the cylinder block at 360 deg to remove all chips from the holes before inspection and tapping. At station 12, an automatic inspection unit stops the machine if the holes are not drilled to the proper depth for tapping. A special coolant system is used to flush the taps. A built-in oscillating type chip conveyor removes all chips.

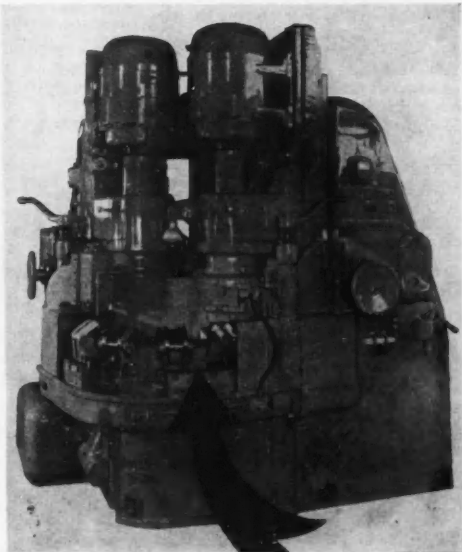
Hydraulic and electrical installations are to J.I.C. standards. Stranded wires are used throughout. The machine is automatically lubricated with each cycle.

Other provisions include hardened

and ground ways and the use of standard Cross units to facilitate maintenance, reduce downtime and provide flexibility for part design changes.

B-45—Rotary Surface Grinder

Mattison Machine Works, Rockford, Ill., has just completed a specially equipped No. 24A2 Mattison (Hanchett Type) rotary surface grinder for finishing the cover of automotive oil pump bodies. Work pieces are held in automatic clamping fixtures as pointed out by the arrow. A safety device stops the table in case the operator does not locate the work properly in the fixture. Automatic sizers are constantly in operation checking the work and keeping all of the pieces within the specified tolerances, without the operator's attention.



B-44—Wet Abrasive Cutting Machine

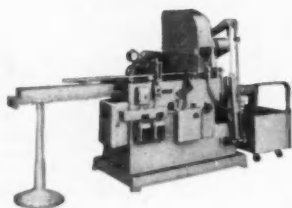
Model 270, wet abrasive cutting machine, put out by the Campbell Machine Division of American Chain & Cable Co., Inc., Bridgeport, Conn., cuts up to 2 in. diam solid annealed or unannealed steel and 3 1/2 in. diam tubing. Because the Model 270 is sequence timed, no adjustment of the time cycle is required, regardless of the size of stock being cut, or the length of the feed up to 12 in. Every operation—stock feed, clamping, wheel feed, adjustment for wheel wear and ejection of cut pieces, is completely automatic.

In operation, the abrasive wheel cuts through the work. During this time the feed carriage is being returned to starting position. At completion of the cut, the abrasive wheel lifts to "up" position. The bar clamp is next closed, clamping the work in the feed carriage; then the work clamp under the wheel releases the bar. Feed carriage is now moved to the right, against its stop. The work clamp at

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the wheel grips the stock; then the bar clamp on the feed carriage releases.



Campbell fully automatic wet abrasive cutting machine, Model 270.

The abrasive wheel is started downward for the cut, and the cycle is repeated.

B-46—Five-Station Transfer Machine

Introduced by Snyder Tool & Engineering Co., Detroit, Mich., is a special-purpose, five-station, line transfer machine which drills the main bearing cap holes and drills, reams and chamfers the master dowel holes in cast iron, valve-in-head cylinder blocks.

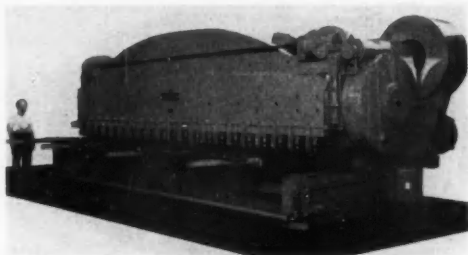
Operation is automatic after loading. Automatic hydraulic clamping is provided at each station. The entire operation requires but 36 seconds, giving a production ratio of 80 pcs an hr at 80 per cent efficiency. The machine can be operated by unskilled labor.

Progress through the stations is as

follows: No. 1, load and turn the part through 90 deg, bringing the bottom face to the right. No. 2, drill 10 holes of various sizes. No. 3, ream and chamfer two holes. No. 4, turn the part 90 deg, bringing the bottom face down. No. 5, transfer the block to the conveyor.

Hydraulically operated, counter-weighted brackets turn the part 90

Cincinnati Shaper Co.
20 ft. long 1/2-in.-squaring shear.



one 10 hp motor for the hydraulic unit. Indexing mechanism is hydraulic transfer type.

Base and column construction is heavy, welded steel plate, thoroughly normalized and braced for rigidity. Necessary floor space is 110 in. by 162 in. Lubrication is automatic through a central system.

B-47—All-Steel Squaring Shears

Latest addition to the line of All-Steel squaring shears manufactured by the Cincinnati Shaper Co., Cincinnati, Ohio, is a shear with a capacity of 20 ft. of 1/2 in. mild steel plate. This squaring shear, to Cincinnati's knowledge, is the longest 1/2 in. shear ever built, weighs over 135,000 lbs and has

deg at the loading and unloading station so that it enters and leaves the machine on the bottom face and transfers through the machine on its side.

Tools are high speed steel revolving at 80 sfpm with feed of 0.099 for drilling and 55 sfpm with feed of 0.015 for reaming. Unit stroke is 14.25 in. Two standard Snyder guide bar units are used.

Drive is by motors through coupling to spur gears using one 7 1/2 hp motor for the drilling operation, one 2 hp motor for the reaming operation, and

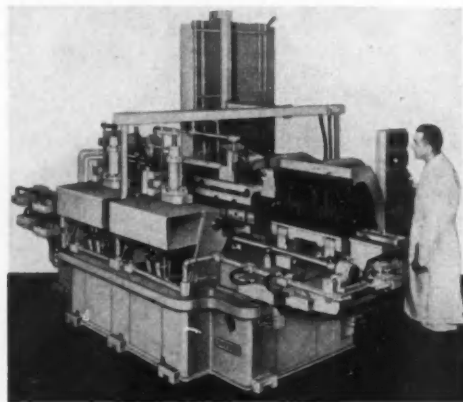
a speed of 20 strokes per min. It is equipped with hydraulic holdowns capable of exerting a holding force of over 70 tons. The holdown pistons are made with automobile type piston rings for long life, and have a vacuum pump arrangement that prevents leakage of hydraulic oil. The shear has a 24 in. throat or gap and a 48 in. back gage range.

Standard equipment includes four edge high carbon tool steel knives with straight sides and a section measuring 1 1/4 in. by 6 1/2 in. ball bearing back gage with graduated dials, automatic lubrication, hinged angle, and complete guarding.

B-48—Controlled Atmosphere Furnace

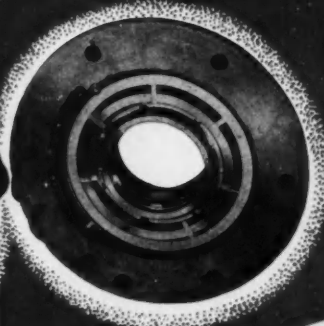
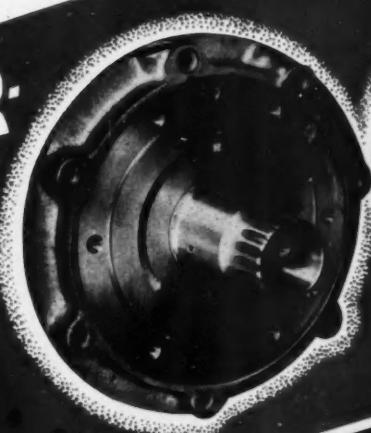
Put out by Ipsen Industries, Inc., Rockford, Ill., is a semi-automatic controlled atmosphere unit for bright heat treating, rated at 100 pieces an hour. Hearth is 12 in. wide by 18 in. long and 10 in. high, with maximum operating temperature 2100F. The unit is designed for bright heat treating, carburizing, carbonitriding, annealing, and copper brazing. For production copper brazing, additional cooling chambers are available.

The unit consists of a furnace sealed to a combination cooling chamber and quenching tanks. Work is manually loaded into the furnace and the transfer from the furnace to the cooling or



Snyder five - station transfer machine.

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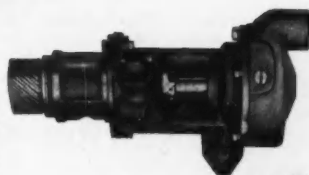
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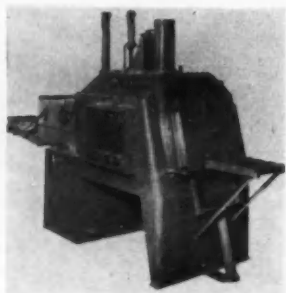
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Societe Anonyme des Automobiles Peugeot in France, for automobile parts stamping production. This large bed area 800-ton blankholder press has an overall height of 36 ft and a total weight in excess of 260 tons. The bed is 156 in. by 96 in.

The press is equipped with a 450-ton blankholder and a 350-ton die cushion, and has a stroke of 72 in. Die-cushion design allows the die cushion to be used as a pressing member (for special reverse draw operations) with a 24 in. stroke—or it can be employed as a conventional pressure pad.

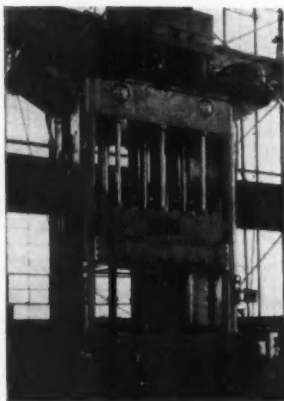
A multiple type ram adds versatility. For preliminary pressings at medium pressures, either the main ram or the two outer rams can be employed. For final forming, all three rams are used for the high pressure required. Pressing speed, up to 530 tons, is 210 ipm and from 530-800 tons, 140 ipm.

quenching section is done without breaking the atmosphere seal.

The furnace is electrically heated, using eight bars for 16 Kw input. The cooling chamber is water jacketed with automatic temperature control. The quench tank has built-in oil heating and cooling coil also with automatic temperature control. A pneumatic operated elevator is used in quenching and the oil has two-speed propulsion. All doors are pneumatically operated.

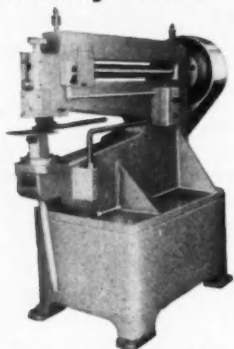
B-49—Huge Hydraulic Press

The huge hydraulic press illustrated, a product of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, is first of two H-P-M presses scheduled for the



H-P-M hydraulic press for automobile parts stamping.

B-50—Line of Nibbling Machines

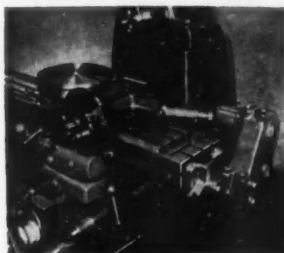
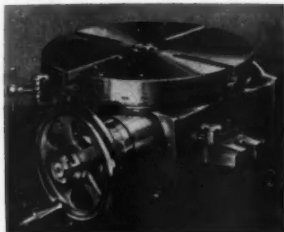


Placed on the market by the Campbell Machine Division of American Chain & Cable Co., Inc., Bridgeport, Conn., is a new line of nibbling machines, for cutting odd shapes of ferrous and non-ferrous metals quickly, cleanly and inexpensively. The nibblers are stated to cut from 40 to 60 times faster than drilling and filing. Work can be fed equally well in any direction because the work is cut with a rapidly moving circular punch which operates over a circular die. Pieces "nibbled" with Campbell Nibbling machines are said to need very little finishing work, the most intricate shapes being easily cut. New models have two-speed drive and variable stroke. Model 430 is shown.

B-51—Two Circular Milling Attachments

A new circular or rotary milling attachment for use with their smaller knee-type milling machines, revealed by the Cincinnati Milling Machine Co., Cincinnati, Ohio, is intended primarily for toolroom work, but when properly tooling up, becomes a high production unit for milling operations on small parts.

The attachment is built in two styles—manual feed, and power feed. For both styles, the table is 12 in. diam, machined with four standard 9/16 in.



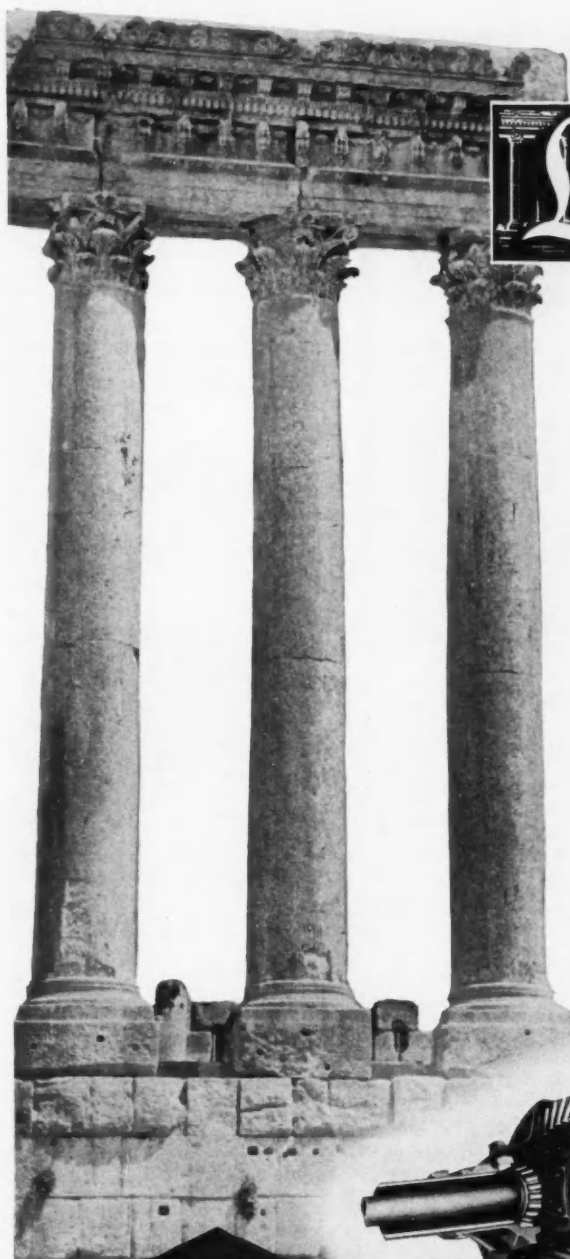
Top—Cincinnati 12-in. circular milling attachment, manual feed; Bottom—Cincinnati 12-in. circular milling attachment, power feed, equipped with an auxiliary indexing attachment.

T-slots, rotated through a worm and wheel having 80 to 1 ratio, and graduated in degrees on its circumference. The handwheel dial is graduated in minutes.

Power feed attachment is driven by the machine on which it is mounted. A shaft beneath the table and parallel to the feed screw drives a gear train within the bracket attached to the right-hand end of the table. Power is transmitted from the gear train to the attachment by a universal jointed, telescoping shaft. A reverse clutch arrangement permits the table to be driven clockwise or counter-clockwise, or disengaged for manual rotary adjustment.

Both manual and power driven styles may be equipped with an auxiliary indexing attachment. The unit employs the same index plate as standard Cincinnati dividing heads.

(Turn to page 60, please)



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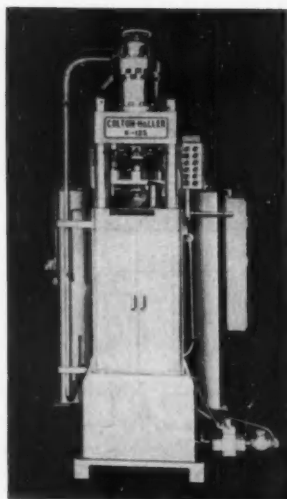
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(Continued from page 58)

B-52—Compacting Presses For Powdered Metals

Two new hydraulic presses for compacting powdered metals and other compounds, announced by Arthur Colton Co., Division of Snyder Tool & Engineering Co., Detroit, Mich., are known as Colton-Haller hydraulic press 6-125 and 6-100, with 125 and 100 ton pressure capacity respectively.

The presses are four tie-rod type with 6 in. die fill and one pressing motion from the top, and one pressing and one ejection motion from the bottom, and stationary core rod. The die opening through the table is 8 3/4 in.

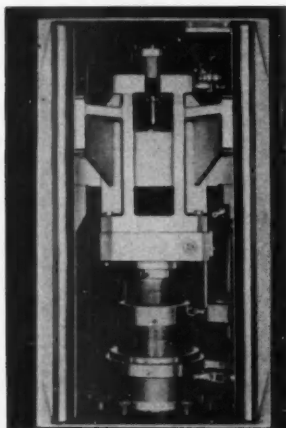


Colton-Haller hydraulic press 6-125 without hydraulic unit.

with 10% in. opening for the flange. Dies can be changed quickly and easily.

Both presses have dual concentric lower cylinders, the outer for compacting and the inner for ejection of compacts. Stroke of each cylinder is adjusted and locked externally. Lower compression stroke can be locked out of operation permitting compressing from the top side only, with ejection cylinder functioning in the usual manner.

The reciprocating feed cup is large and is hydraulically agitated over the



Colton-Haller hydraulic press 6-125 with detail showing lower compression cylinder, ejection cylinder and core rod.

die cavity. Agitation is adjustable by independent control. For compacting materials requiring less pressure per sq in. than for metal powders, a shuttle type feeding mechanism can be provided which will permit the compacting of larger size pieces.

The presses have a 3,000 psi hydraulic system for the final pressing, and a 600 psi large volume, primary pressure for fast approach speeds. Complete cycles are approximately twelve per minute with full 6 in. die fill, and approximately eighteen per minute with 3 in. die fill.

The presses are sequence operated; cam actuated limit switches set the subsequent motions in operation.

B-53—Boring, Drilling And Milling Machine

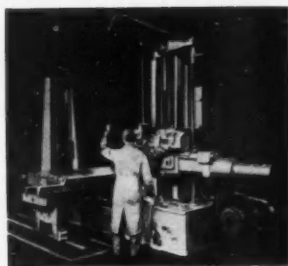
Speeds from 10 to 1300 rpm in fine increment through 45 changes are provided by the new single-spindle high speed horizontal boring, drilling and milling machine put out by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wisc.

Closer speed selection permits maximum machining efficiency when using carbide and cast alloy tipped cutting tools. Where carbides are not required the new machine has capacity and adaptability for all types of light, medium, and heavy duty machining. Six entirely new structural features have been added to permit faster cut-

ting speeds, heavier cuts, better finishes and greater accuracy. First, heavy duty, hardened bed and saddle ways are used, mounted on the bed and saddle by a new method of doweling to minimize transmittal to the ways of any torque strains and stresses set up by temperature change. The way mounting also partially compensates for vibration created by other industrial machines.

Second, a single 4 in. diam nitralloy steel spindle having a travel of 30 in is furnished. Rotating on anti-friction bearings, speeds up to 1300 rpm permit all types of carbide cutters to be used. High speed milling, boring and sensitive drilling are both possible and practical.

Third, positive, automatic machine settings to extremely close limits are possible with the G. & L., a quick-acting, electrically operated positioning device. The predetermined settings of the machine table and headstock are mechanically controlled, without requiring time-consuming final hand adjustments. The unit also reduces and may eliminate need for special jigs and fixtures. When a single part is machined, end measures are used in the conven-



Giddings & Lewis single-spindle high-speed horizontal boring, drilling and milling machine.

tional manner to determine locations. Job rods and similar devices may also be used for production machining.

Fourth, an electric bush-button control station having forward-reverse-stop-and-inch buttons is provided in a swiveling pendant suspended from the top of the machine column. This swiveling pendant control box can be swung in a semi-circle to any position, always with fingertip accessibility to the operator.

Fifth, a new simplified gear change requires only two hand cranks. These combined with a direct reading dial facilitate speed changes. The operator may select any of the 45 spindle speeds without reading a complicated chart. Hand cranks may be rotated in either direction.

Sixth, to meet exacting demands of higher cutting speeds and heavier loads, gears in the high speed machines are now cut and shaved, followed by hardening, to close tolerances.

**PERFECT CIRCLES Are Preferred
by 21 of 25 Leading Engine
Manufacturers Using Chrome Rings**



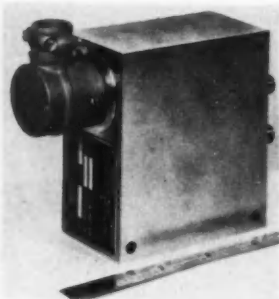
**Perfect
Circle**

*The Most Honored Name
in Piston Rings*

The application of solid chrome plating to piston rings, perfected by Perfect Circle, more than doubles the life of pistons, rings and cylinders. Performance data will be furnished upon request.

NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 54



Baldwin-Lima-Hamilton SR-4 differential pressure cell.

C-82—SR-4 Differential Pressure Cell

Differential pressure cells based on SR-4 resistance wire strain gage measurement have been added to the line of standard products, placed on the market by Baldwin-Lima-Hamilton Corp., Phil., Pa. Identified as Type FMB, these cells are interchangeable, precision products having high accuracy, with full compensation for temperature and linear acceleration. Two pressure ranges are available: ± 10 and ± 20 lb per sq in. Maximum permissible line pressures are 50 and 100 lb per sq in. respectively.

The Type FMB SR-4 differential pressure cell consists of a pair of matched Monel metal pressure bellows arranged to apply opposing forces on a cantilever beam to which SR-4 strain gages are bonded. The sensing element is hermetically sealed by solder in an aluminum box. Electrical connections are made through glass-to-metal seals. The cell is insensitive to linear acceleration in any direction and may be mounted in any position without affecting pressure indications.

Differential cells are designed for the standard 120-ohm circuit and for 300-ohm circuits. Recommended input voltages are 6 volts and 12 volts respectively with maximums of 8 and 16 volts respectively. Output at rated differential pressures is $2.000 \pm .005$ millivolts per volt input. Cells are temperature compensated for zero and span. Calibration accuracy is within $\frac{1}{4}$ per cent of full scale anywhere within the rated range.

In addition to differential measure-

ments of fluid and gas pressures, the cells may be used for measurement of flow, liquid level, and other purposes such as determination of airfoil pressure distribution in wind tunnel tests. They may be used with standard Baldwin and other indicating, recording, and controlling instruments.

C-83—Simplified Electric Tachometer

An electric tachometer of simplified design which can be installed on a truck, passenger car, stationary or marine engine in a matter of minutes,



Stewart-Warner Vac-Tach electric tachometer, Model No. 760-C—one of three units.

and which will give accurate reading of engine revolutions with no lag or overrun, has been announced by the Instrument Division of Stewart-Warner Corp., Chicago, Ill. Drive design consists of two simple units—a sending switch which is attached to the distributor—and the tachometer head which contains the receiving mechanism. The tachometer head is mounted on the steering post or dash and is connected to the sending switch by wire cable. Current is supplied by the vehicle's electrical system.

The sending switch revolves with the distributor shaft and transmits current impulses to the receiver which actuates the tachometer mechanism and pointer. The device uses no relays, oscillators or gear and flexible shaft arrangements.

The tachometer is available in three models, all with full 270 deg. dial scale. The "Standard Model" is for six volt systems, shows engine speeds up to 4500 rpm, and has engine "economy range" markers.

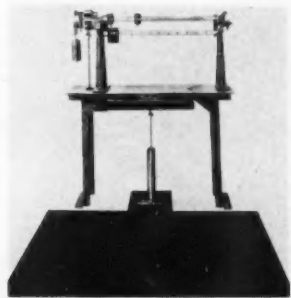
The "Recorder Model" has the same size face dial, speed range, etc., as the "Standard Model" but has, in addition, an odometer or revolution counter which registers up to one billion engine revolutions before starting over. This feature makes possible accurate scheduling of maintenance and service work and accurate measurement of engine life. "Recorder" models are available for twelve volt as well as six volt electrical systems.

The "Vac-Tach Model", for six volt systems, has both an odometer and a built-in vacuum gauge which serves as an engine analyzer and shows the condition of the engine at all times. The Vac-Tach has a $4\frac{1}{4}$ in. face dial. Standard and Recorded models have 3 in. dials.

C-84—Platform Beam Scale

For fast accurate heavy-duty "shock-loading" industrial weighing applications a platform beam scale called the Load King has been designed by the Yale & Towne Mfg. Co., Phila. Division. The lever system in the platform is all-steel as are other key parts. Throughout no wood is used.

Poises on the main bar are mounted



Yale & Towne platform beam scale, the Load King.

on roller bearings for rapid positioning. A 100 per cent end loading platform gives the same reading on the scale regardless of the location of the load on the platform. The platform, which is mounted on outboard bearings also absorbs the shock of moving loads without damage to the scale. It will not tip.

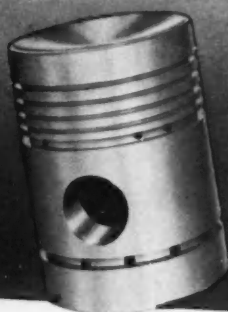
Pit requirements for the Load King



Air Craft



Wet Sub-Threshold



Diesel



Trans Slot



Heavy



Wing Insert



Two Cycle



Steel Truss



Turbulator head



T-Slot



Trunk Type

Every Type Aluminum Piston
... *One* Standard of Quality

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for 30 Years

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STERLING ALUMINUM PRODUCTS INC.

ST. LOUIS, MO.



NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 54

are only 11 in., saving considerable expenditure on excavation when the scale is installed. Available in self-contained and semi-self contained models, the new scale is built in capacities up to 6,400 lbs. Platforms for the new scale range from 46 by 38 to 76 by 54 in.

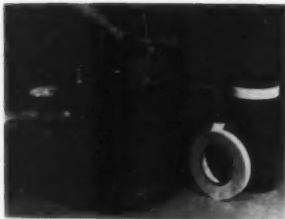
C-85—Two New Sealing Tapes

Two new types of sealing tape utilizing Geon polyvinyl resin, a product of B. F. Goodrich Chemical Co., Cleveland, Ohio, have been introduced by Technical Tape Corp., New York, N. Y.

The first, a water and moisture proof tape designed by the organization primarily for sealing packages for overseas shipment, meets Government specifications JANP 127 and ANT 12-A, containing a Geon polyvinyl compound, this pressure sensitive, waterproof cloth tape is also available for civilian use in olive drab, white, and black colors. It is utilized principally for applications that require a stronger and more resistant material than paper, as in sealing cans, reinforcing and sealing cartons.

The other development, "Break-Pruf" tape, is reported replacing short supply metal strapping at considerable savings. Break-Pruf is used for heavy duty operations such as wrapping coils of wire, metal strips, banding plate glass, rods, tubing, lumber, etc. Consisting of a paper backing reinforced with longitudinal glass fibers, the tape is declared to have excellent tear resistance, tensile strength, and adherence.

Geon polyvinyl materials impart to the tapes qualities of extraordinary resistance to high temperature, aging, greases and chemicals. Good abrasion and deformation resistance, flexibility at both high and low temperatures, and a smooth, glossy surface are added attributes.



Technical Tape Corp. waterproof barrier tape in use.



Yale standard industrial truck equipped with high telescoping lift device.

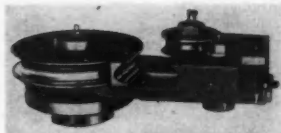
C-86—Triple Lift Fork Truck

A design innovation that permits standard 83 in. over-all height telescopic lift trucks to tier loads in greater than 16 ft stacks is announced by the Phila. Division of the Yale & Towne Mfg. Co., Phila., Pa. This Yale triple lift fork truck tiers loads to 197 1/2 in.

The new device consists of an extra set of front channels and an additional lifting cylinder. The channels are hung directly in front of the regular telescopic channels and are operated by a separate control. This extra attachment can be quickly removed for normal fork truck operation.

C-87—Automatic Die and Clamping Head

An automatic die and clamping head, a product of Paul Machine Tool & Die Works, Chicago, Ill., grips and bends tube automatically and can be attached to all previous model "A" and "Y" Bendex bending machines put out by the



Paul automatic die and clamping head.

company, to double the production of the bender.

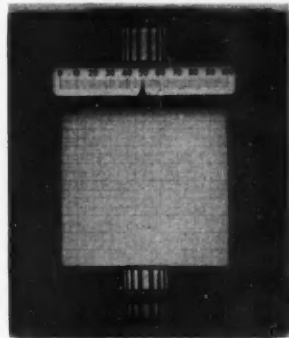
Up to 1,000 bends per hr are said to have been achieved on 1-in. 16 gage steel tubing with a 2 3/4 in. center line radius. Up to a 9 1/2 in. center line radius is possible.

Interchangeable dies and jaws are available for different tubing diameters and radii—easily and quickly attached.

C-88—Electronic Recorder For Test Data

A Speedomax electronic recorder announced by Leeds & Northrup Co., Phila., Pa., provides a range continuously adjustable over a 20:1 ratio, and zero suppression adjustable over more than twice the maximum range. Through use of a particular suppressed zero range, an operator can ignore that portion of the range in which he is not interested, while he spreads the few millivolts he wants to watch across the entire width of the instrument chart. Adjustable range permits the user to select his own scale calibration at will.

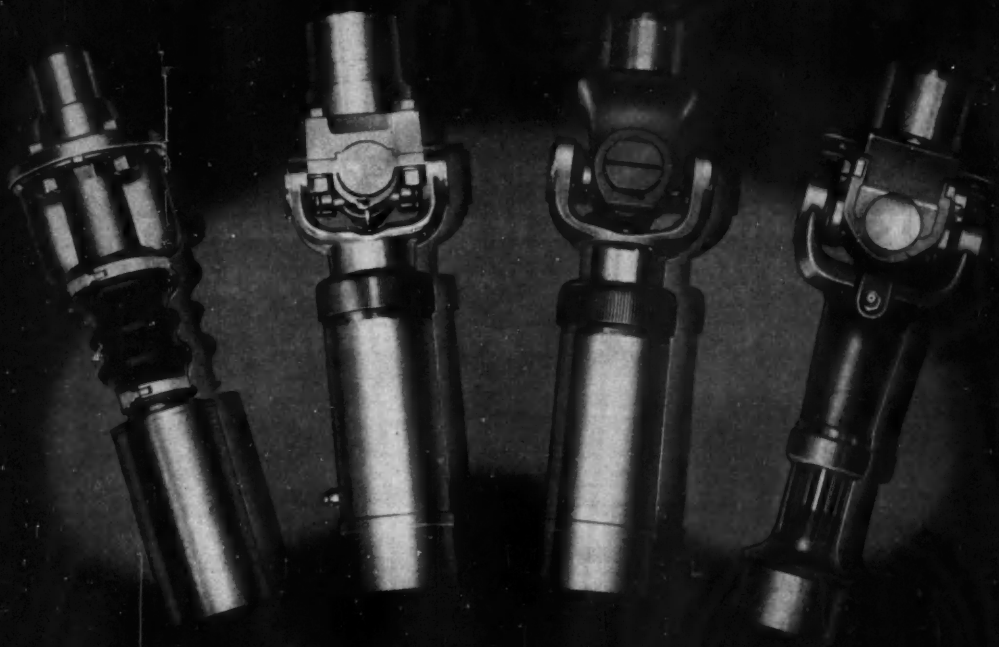
Some typical measurements include measurements with strain gages—for experimental stress analysis, weighing operations, etc. Adjustable zero compensates for tare weight; range can be



Leeds & Northrup Speedomax electronic recorder.

adjusted to provide the desired scale calibration. Another measurement is that of temperature difference with thermocouples—in measuring small temperature changes at elevated temperatures. Also, by use of an electric tachometer as the primary element this recorder can measure change of speed over a narrow range, or assist in the (Turn to page 67, please)

DETROIT Universal Joints are Available



For Practically Every Field of
Power Transmission

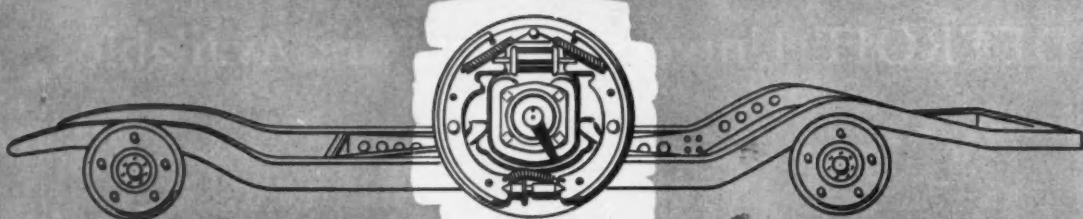
DETROIT Universal Joints are used as original equipment on many makes of cars, trucks, military vehicles, tanks, tractors, railroad equipment, mine locomotives, power take offs, and other applications.

Detroit

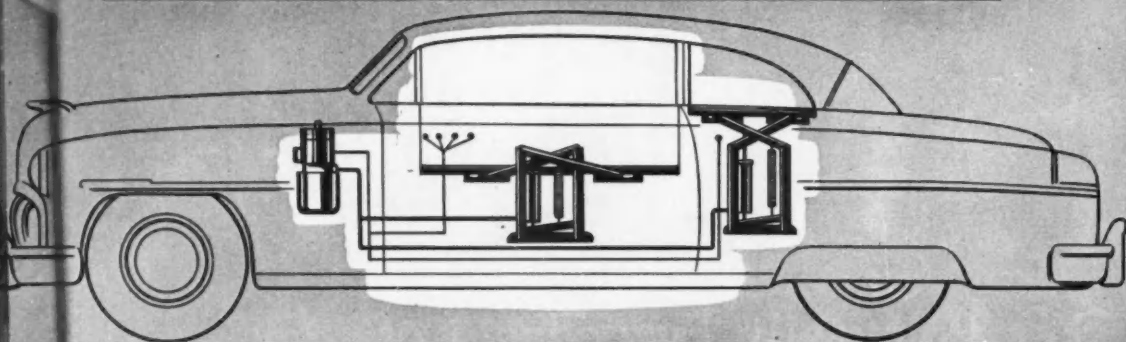
UNIVERSAL JOINTS



UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

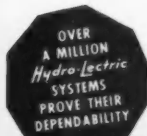


**Car Engineers Specify
Hydraulic Brakes for Dependability
...and *Hydro-Lectric* Window Lifts
for the Same Reason**



Because they eliminate complicated gearing and linkage, and because they assure positive action, hydraulic brakes long ago replaced the mechanical type.

Hydraulic controls have been proved best for automatic window operation, too. The Hydro-Lectric system, developed by Detroit Harvester, is unchallenged for dependability and trouble-free service. It is the only unit which has been proved in actual operation on hundreds of thousands of cars.



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Convertible
Tops

Hydro-Lectric
Systems

Power
Mowers

Side Delivery
Rakes

Power
Sweepers

Window Channels and
Regulator Assemblies

Automotive
Hardware

Power
Take-Offs

Contract
Production Parts

NEW PRODUCTS

For additional information please
use coupon on page 54

(Continued from page 64)

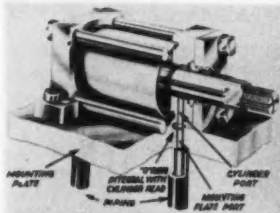
study of speed regulation characteristics of motors, engine governors, etc.

Calibrated d-c millivoltage range is adjustable from a minimum across-chart span of 1.1 mv to a maximum range span of 22 mv. Uncalibrated coarse and fine rheostats provide maximum zero suppression of -50 or +50 mv, continuously adjustable between these limits. These adjustments are independent. Range remains constant during zero adjustment; zero suppression remains constant during range adjustment.

C-89—Labor-Saving Cylinder Mounting

Quick, easy installation of air and hydraulic cylinders singly or in space-saving, side-by-side, manifold mounting without the time, labor and cost of making the actual pipe connections to the cylinders, is an advantage of the new "O" Ring cylinder mounting offered in addition to its 13 standard mountings by Miller Motor Co., Chicago, Ill.

The air or hydraulic piping is directly connected to ports in a machined flat surfaced mounting plate or manifold and the cylinders are mounted on this plate with their ports mating in



New time, labor, space- and pipe-saving cylinder mounting offered by Miller Motor Co.

perfect alignment with the mounting plate ports. "O" Ring seals at the mating surfaces of the cylinder ports assure a leakproof seal under pressure and suction and conform to the J. I. C. Hydraulic Standards. The "O" Ring seal is preassembled into the port of the cylinder thus eliminating the difficult job of installing the "O" Ring assembly separately. The mounting flanges of the cylinder are secured to the mounting plate by regular mounting bolts or screws. Thus, installation, removal and replacement of cylinders

are simply accomplished without having to connect or disconnect any piping. Installation or removal of the mounting bolts or screws is all that is necessary.

Other claimed advantages are: greater hydraulic fluid flow because the

"O" Ring ports are equivalent to ports one size larger than the conventional standard ports in which the pipe inner diameter fills part of the port hole; minimum pressure loss, smoother fluid flow, elimination of turbulence and aeration as sudden changes in transverse internal areas of pipes and fittings are eliminated.

(Turn to page 68, please)

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through "Sound" Research

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360 NORTH MICHIGAN AVENUE
CHICAGO 1, ILLINOIS

NEW PRODUCTS

(Continued from page 67)

C-90—Oil Filter Cartridge

Wisconsin Motor Corp., Milwaukee, Wis., in collaboration with Wix Acces-

sories Corp., have developed a super filter, designed to match the lubrication system of the V-type 4-cylinder Wisconsin air-cooled engines. The filter adds many extra hp hours of service to the life of the engine by keeping the oil free from dirt, filings, sludge and

For additional information please use coupon on page 54

acid that accumulate in the crankcase. Called the Micro-Fine oil filter cartridge, it is a combination of two perfect filtering mediums—virgin cotton and plastic impregnated wood cellulose. This filter removes solids of micron size, measuring less than 1/10,000th of an in. (0.000045 in.). It holds its own dry weight of acids, dirt, and filings, according to the manufacturer, the thread of the cartridge being machined to fit perfectly on the oil filter base, for vibration-proof, leak-proof oil seal.



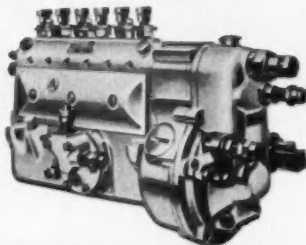
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Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported—whether to Trondheim, Santiago, Hong-Kong or Sydney—there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



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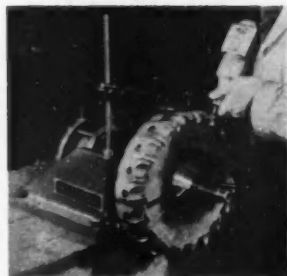
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., NEW YORK 19, N.Y. Sales Office: 14820 DETROIT AVE., CLEVELAND 7, OHIO

174-3448

C-91—Electronic Temperature Recorder

An electronic recorder for accurately and quickly measuring temperature of the rotor in large electric generators has been developed by Minneapolis-Honeywell Regulator Co., Phila., Pa. The ElectroniK has been designed to better assist operators in avoiding overloads. It furnishes a 12-in. strip chart record which can be used as a guide for gradually cooling a generator. The recorder has a range of 0 to 150 C, a limit error of 1.5 C, a dead zone of 0.3 C, and a pen speed of 1.4 minutes full scale. Its range of rotor winding resistance is 0.1 to 4.0 ohms and it has a dielectric test of 1500 volt rms for one minute. In designing the new instrument special consideration was given to users who generate large volumes of their own power, and want maximum safety and dependability for peak capacity operation.

C-92—Vise For Holding Milling Cutters



New cutter vise, placed on the market by the Ingersoll Milling Machine Co., Rockford, Ill., holds inserted-blade milling cutters firmly in a convenient position while blades are being reset. With cutter rigidly clamped, wedges can be driven and screws tightened rapidly. Power-operated jaws of the vise are opened and closed by an air-pressure valve as the operator indexes the cutter. Pointer mounted on the vise is used in setting blades to the same height. Arbors for cutters with 1½ in. and 2½ in. diam bores are standard equipment. Arbors for other bore diameters are available.

DUALOY^{*}

THE BI-METALLIC MOLECULAR BONDED PISTON

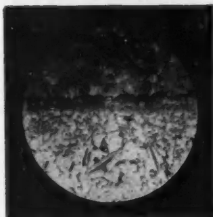
THE FIRST BASIC IMPROVEMENT IN HEAVY DUTY PISTON DESIGN



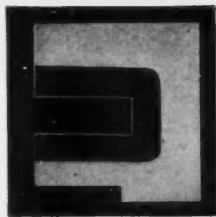
DUALOY^{*} introduced an entirely new principle to correct the causes of top ring groove failures. By an exclusive and patented process, an austenitic iron (ni-resist) ring carrier is cast and integrated into an alloy piston to produce a bi-metallic molecular bonded unit that will out-wear and out-perform any other piston in the heavy duty field.

DUALOY^{*} Pistons are a time and experience proven development in heavy duty piston design. DUALOY^{*} users have found that these molecular bonded ni-resist top ring carriers actually reduce excessive wear in the top ring land, and that engines equipped with DUALOY^{*} pistons are consistently rolling up mileage of 200,000 — and over.

You can reduce operating and maintenance costs and eliminate costly roadside engine failures with DUALOY^{*} Pistons. Buy DUALOY^{*} for longer piston life.



Photomicrograph of
Bi-metallic Molecular Bond



Enlarged Cutaway of
Ni-resist Ring Groove

^{*}Trade Mark Registered.

^{*}The manufacturers of SILV-O-LITE have been licensed by Fairchild Engine & Airplane Corporation under patent 2396730 and 2455457 to use the Al-Fin Process in the manufacture of bi-metallic molecular bonded pistons.

SILV-O-LITE

● Better Pistons Since 1922

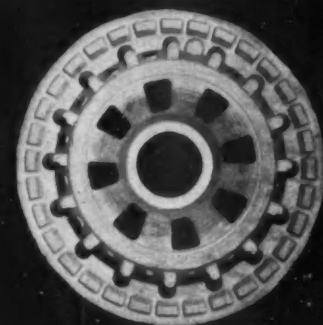
Silv-o-lite has the most complete line of passenger car and heavy duty pistons available. Heavy duty types are available with or without DUALOY^{*}, according to your requirements for top ring land protection.

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70

Italy Makes Rapid Progress in Jet Fighter Program

Italy has made unexpectedly rapid progress in the program for the construction of jet fighter planes under De Havilland license. Although the agreement was only made on November, 1949, Italian-made jigs and tools are in readiness which will enable quantity production of the Vampire fighter to start almost immediately. The Venom fighter has now been added, and this calls for the bigger Ghost engine.

The arrangement brings together the resources of two famous Italian engineering concerns. The Fiat and Alfa Romeo companies are building the Ghost jet engine, while the Fiat, Macchi, and Ambrosini concerns between them will build the Venom airframes, assembly of which will take place at the Fiat and Macchi works. The administrative side of the whole organization is being coordinated by the Sicmar company, which was specially formed to acquire the licenses and materials.

In France the Vampire is being built by the Société Nationale de Constructeurs Sud Est, near Marseilles. The French have assisted the Italians notably in the conversion to metric measurements. British, French and Italian jigs are checked to a uniform standard under De Havilland auspices and complete interchangeability of all major components is maintained between the three countries. The Venom is a direct development of the Vampire and both are expressly designed to give combat effectiveness at great heights. There are two-place night fighter versions as well as day fighter and ground attack versions of both types.

AMA Program Stresses Essentiality of Cars

With Washington officials still apparently unconvinced as to the essential nature of passenger cars, the Automobile Manufacturers Association is waging an intensive campaign to stress to both the government and the public generally the vital role that passenger cars play in the national economy. The industry recently made a presentation to NPA which stressed the following facts: (1) in terms of mileage and trips more than half of all automobile use is for earning a living; (2) average age of passenger cars today is nearly eight years, compared with 5½ years in 1941; (3) no middle age cars—five to seven years old—are available today for replacement because of interruption of production by World War II; (4) from 60 to 76 per cent of all cars bought by farmers and skilled and unskilled workers are used cars; and (5) one-third of cars in use today are 10 or more years old with an average of 79,000 miles on the speedometer.

AUTOMOTIVE INDUSTRIES, April 1, 1951

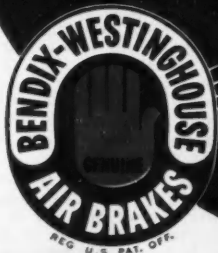
"THE BENDIX-WESTINGHOUSE
DISTRIBUTOR WAS CERTAINLY RIGHT..."

The Added Efficiency Pays For Itself!"

THE
BEST
BRAKE



Judge braking efficiency on a dollars and cents basis—what it means to you and your business in terms of hard cash savings and profits. When you look at it this way, the records regularly rolled up by Bendix-Westinghouse Air Brakes are amazing! Maintenance and parts replacement costs are cut to the bone, trucks aren't laid up for expensive overhauls and adjustments—they *stay* on the job hauling valuable pay loads. Add to this the extra safety, positive braking control and faster trip speeds and you can see why enthusiasm runs high for these mighty brakes. Whether you operate one truck or one hundred, take advantage of this extra efficiency—specify dependable, economical Bendix-Westinghouse Air Brakes, world's safest power-to-stop!



THE BEST AIR BRAKE IS

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY
ELYRIA, OHIO

METALS (Continued from page 43)

that the Government was deferring deliveries of metals to the stockpile.

Zinc Market Undisturbed

Announcement that the Government would extend the period for delivering zinc to the stockpile failed to disturb the market. Demand for zinc is extremely strong at 17½ cents a pound, with the export market much higher at upwards of 27 cents a pound. It's reported that 43-45 cents a pound is

paid for small lots of zinc on the Continent.

February zinc statistics show that production and shipments of slabs were down, due in part to the shorter month. Significantly the shipments to the stockpile dropped to 2280 tons against a monthly average in 1950 of 10,700 tons. Stocks of slab at the end of February were 11,117 tons, about 2200 tons more than at the end of the year. Unfilled orders gained 1700 tons and stood at 76,400 tons. Special high grade zinc

was in high demand from the diecasters who are anxious to get inventories to the allowable limit before cutbacks are enforced. It is expected that NPA will order a further cutback to 75 per cent in the permitted use of zinc.

Nevertheless, it's felt that the cutbacks ordered in civilian consumption together with the easing in stockpile requirements will bring demand and supply more or less in balance later in the second quarter. It's unlikely that any surplus metal will come on the market even if DO requisitions lag. Export business which had been at a very low level because of lack of metal to sell abroad, may be depended upon to take care of any surplus zinc.

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Blakeslee SOLVENT VAPOR DEGREASERS
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more efficient—USE
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Metal Parts Washers
for use with cleaning
compounds on either
batch or production jobs.

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Tin Price Collapse

Following a blast from a Senate Committee that the Government and American consumers were being gouged by foreign tin producers and speculators, the General Services Administration representing the Munitions Board announced it would halt all purchases of tin for the stockpile immediately. Within a week's time the tin price collapsed from \$1.82 to \$1.34 a pound in New York, with similar declines in London and Singapore.

The Government agency has announced that further purchases would be suspended until the price had reached a "reasonable level." No hint was given of what this would be.

A further order from NPA made the RFC the sole U. S. importer of tin, thus placing the metal under complete Federal control. Effective May 1, NPA will allocate tin completely to domestic users. Anyone wanting to deliver or accept deliveries of tin will first have to have a specific authorization from NPA.

More DO Orders for Steel Mills

A major headache for the steel industry has been a serious shortage of steel scrap which is steadily worsening. Steel mills are now obliged to use 70 per cent pig iron, 30 per cent scrap steel in consequence. Several reasons are ascribed for the shortage—price controls, bad weather that hampers collection of scrap, embargoes abroad against export of scrap, railroad car shortages at home. But in the main it's just due to current high rate of steel production that doesn't bring a proportionate increase in scrap because so much of the steel output has gone into capital goods. In 1950 about 29 million tons of scrap were needed to produce 96.7 million tons of ingots and castings. Steel officials estimate there may be about six million tons deficit in the year ahead.

NPA has directed that steel mills must fill an increased amount of DO priority orders from now on. Increases range from five per cent in case of steel wire to 28 per cent for strips of alloy

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NATURALLY
FREE
to

- remove stem deposits
- wipe away seat deposits
- prevent guttering

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naturally means:*

- Longer valve life
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- Maintenance of power output at approximately new engine levels

Eaton engineers will welcome an opportunity to discuss the application of Eaton Free Valves to engines proposed or now in design.

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PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

steel over and above normal DO requirements currently booked. For stainless steel products the ratio has been increased from 25 per cent to 50 per cent and for hot rolled sheets from 17 per cent to 25 per cent.

In February steel production set a

new high for the month with production of 7,762,000 net tons of ingots and castings. This was an increase of nearly 1,000,000 tons over February, 1950. The industry operated at 100.5 per cent capacity in the first two weeks of March.

Extruded Hollow Propeller Blades

(Continued from page 33)

be put through another series of dies. In this operation, the shank or hub section is expanded and tapered in preparation for the final extrusion of the propeller blade tube.

The work is again reheated and placed in the extrusion press for the third and final time. It leaves in the form of a tapered-wall, seamless, round tube with ears or ridges running from

the shank end to the tip. Wall thickness of the tube is held to a tolerance of 0.015 in. during the final extrusion operation.

The steel tube is then transformed into a propeller blade by heating, flattening, and forming against a die which gives it the proper shape. Nitrogen, under 1100 psi pressure, provides internal support during this operation—commonly known as blow-up. The ears or ridges of the extruded tube become the solid leading and trailing edges of the propeller blade.

Actually there is only one major machining operation in forming a finished blade from an extruded tube and that is done on the shank or hub end. Subsequent finishing operations are similar to those now in current use. Completed extruded blades are of the same hollow-steel monocoque design as conventional welded blades.

Production for Air Force aircraft already has been started and plans are being made to supplement current welded types with extruded blades as rapidly as facilities become available.

Torsional Vibrations Minimized

(Continued from page 48)

in an efficient range to prevent engine fouling, and to maintain a satisfactory battery charging rate. This control was previously available only on smaller hydraulic drives with 14 in. and 17 in. size couplings.

Control of the coupling fill is actuated by a manually operated valve which permits increasing the slip from normal 3 per cent to as much as 30 per cent. Full speed, full power operation is instantly returned with complete coupling fill and normal reduction. With the fluid coupling operated at complete or partial fill, torsional vibrations are absorbed in a fluid cushion.

Beech Aircraft Increases Line of Bank Credit

In order to provide working funds for increased production of military orders, the Beech Aircraft Corp. has increased its bank credit line through a \$10 million loan agreement with seven banks. During World War II, the company had a \$50 million credit arrangement with the same banks. The company's gross sales last year totaled more than \$20 million and the present backlog of orders now approximates \$100 million.

Allied Products Corp. Gets Michigan Powdered Metal

The Allied Products Corp. Detroit, Mich., has acquired all of the outstanding stock of Michigan Powdered Metal Products Co., Inc., Northville, Mich. As a result, the Northville company has become a wholly-owned subsidiary of Allied Products.

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AND OTHER BALL APPLICATIONS**

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BALLS**

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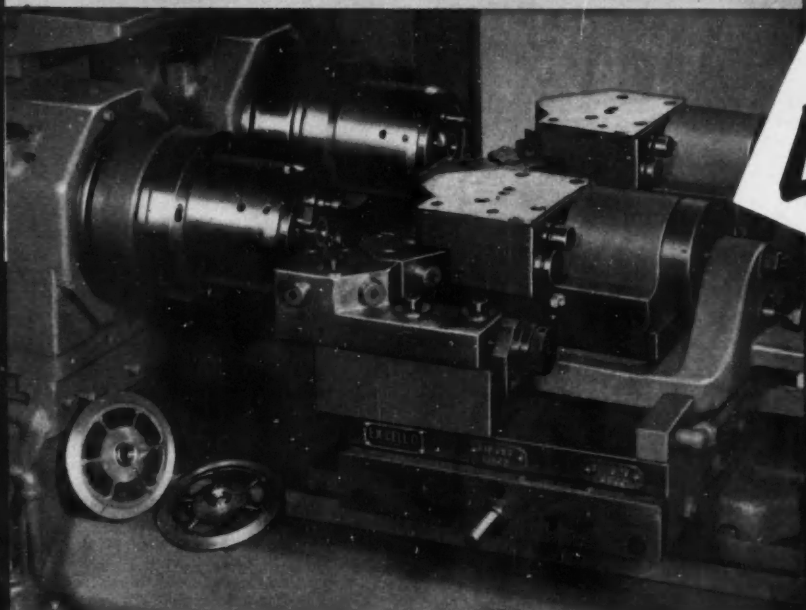
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MACHINING**
the
**EX-CELL-O
WAY**



Flexibility, economy, and high production are all yours with Ex-Cell-O 2112-A Precision Boring Machines. Shown here is a typical use that may suggest a money-saving method for your shop.

Ex-Cell-O engineers designed chucks that clamp die cast aluminum parts by the fins to solve two problems: (1) clamping frail parts without distortion; (2) boring the I.D. and turning the O.D. in one machine cycle.



**Ex-Cell-O Style 2112-A
Precision Boring Machine.**

The operations, performed on two parts simultaneously, include boring inside diameter; chamfering outer edge of bore; turning outside diameter and pilot diameter; facing the small hub and area between outside diameter and pilot diameter; and chamfering outer edges. Net production is 102 per hour.

It may be that a versatile Ex-Cell-O machine of this type is the answer to your machining problem. For full information and specifications, contact your local Ex-Cell-O representative, or write Ex-Cell-O in Detroit today.



Excellent use
of stock show-
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in heavy line

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PRODUCTS of all three United Specialties plants — Chicago, Philadelphia, Birmingham — are in increasingly urgent demand for application on units needed for defense requirements.

United Specialties Company manufactures an extensive range of over 260 oil bath air cleaner models for every type and size of internal combustion engine — plus ignition switches, turn signal switches, rolled shapes and television shells.

UNITED SPECIALTIES COMPANY

Chicago 28 • Philadelphia 36 • Birmingham

Publications Available

(Continued from page 54)

A-95 Brushes

The Osborn Manufacturing Co. — A new 76-page brushing catalog, No. 210, designed to simplify selection of the best brush for the individual job, has just been issued. It presents numerous illustrations of industrial brushing operations in addition to photographs and descriptions of Osborn's complete line of power, paint, varnish and maintenance brushes.

A-96 Recorder Equipment and Tachometers

Leeds & Northrup Co. — To describe how speed recording is increasing production efficiency, product quality, and output in various industries, the company has just published a completely revised, 20-page edition of its speed recorder catalog, N-27, entitled "Micro-max and Speedmax Speed Recorders."

A-97 Jacks

The Buda Co. — A new 16-page, bulletin, Catalog No. 1515, which has just been released by the company, illustrates and describes their complete line of ratchet, screw and hydraulic jacks in capacities from three to 75 tons.

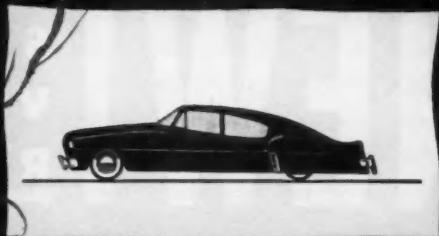
A-98 Fastening Methods

Reynolds Metals Co. — Latest addition to the group of technical books published by the firm is "Mechanical Fastening Methods for Aluminum." There are 136 pages of information on the many different ways for mechanically joining aluminum parts, including the use of metal stitching, resin bonding and ingenious mechanically formed joints. Other joints are made with rivets, screw fasteners, nails, or pins — all are described in detail, their applications analyzed and advantages pointed out. It is available to those who request it on their company letterhead.

Machine Tool Backlog of Orders at Peak

Machine tool order backlogs at the end of January were at, or near, the industry's all time high, attained during the best month of 1942. Shipments declined in January from the high levels in December because of serious material and manpower shortages. The shipments index in January was 113.9, more than double the 52.8 figure of January, 1950. Foreign orders dropped in January to 62.2 from 112.8 in December, but were considerably higher than the index of 26.7 of January a year ago.

AUTOMOTIVE INDUSTRIES, April 1, 1951



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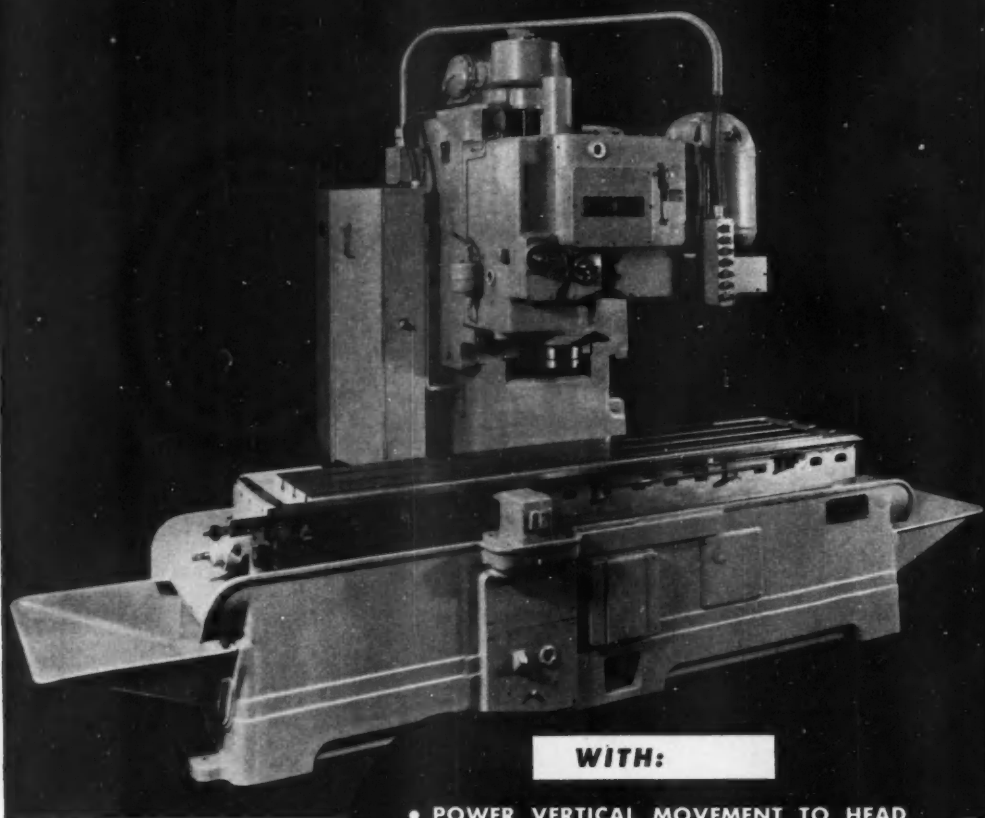
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NEW! SUNDSTRAND VERTICAL HEAD RIGIDMIL



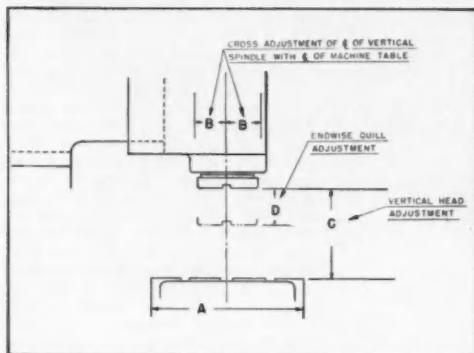
WITH:

- POWER VERTICAL MOVEMENT TO HEAD
- AUTOMATIC TABLE CYCLES
- POWER POSITIONING TO HEAD CARRIER
- AUTOMATIC CUTTER RELIEF



RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

This new vertical spindle arrangement is available with the Sundstrand Models 22 and 33 Rigidmils — up to 25 horsepower heads. The machine has power vertical adjustment to spindle head, endwise quill adjustment and cross adjustment to the spindle head carrier. It is easily and quickly adjusted to handle a wide range of work and to simplify set-ups.



Machine	A	B	C		D
			Min.	Max.	
Model 22	12"	3"	6"	14"	2-1/2"
Model 33	18"	4"	6"	18"	5-1/2"

Schematic drawing of endview and chart showing capacity of new Sundstrand Rigidmil.

Power Movement To Head

The vertical head is mounted on vertical ways and provided with power vertical movement. This feature makes it possible to clear bosses or obstructions quickly while milling. The range of power adjustment for the Model 33 Rigidmil is from 18" max. to 6" min. between spindle nose and top of machine table.

FREE DATA

It may pay you to keep abreast of current developments in Sundstrand machine designs. Write for descriptive literature of these new models. Ask for bulletin 206.

Automatic Table Cycles

Table cycles for these Sundstrand Rigidmils are automatically controlled by dogs mounted on the front of the machine table. The dogs are easily adjusted and proper set-ups for production milling operations can be made quickly. A wide variety of table cycles are available and feed rates range from 1/2 to 50 or 1 to 100 inches per minute. The rapid traverse rate is 300 inches per minute.

Power Positioning To Head Carrier

The vertical head is mounted on an adjustable carrier which provides the vertical spindle with four inches of cross movement either side of the center line of the machine table. This cross adjustment is made easily and quickly by power. All movements are controlled by push button.

Automatic Cutter Relief

At the completion of the cut, the spindle head automatically retracts for cutter clearance on the return stroke and is automatically re-set at the end of the return stroke for the start of a new cycle.

The machine can be hand controlled by push buttons for single job set-ups or automatically by table dogs for production milling.



SUNDSTRAND
Machine Tool Company

2571 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES •

SPECIAL MILLING AND TURNING MACHINES

How Tool Life is Affected By Heat Resist Alloys

(Continued from page 52)

high shear strength during cutting; (2) they have the capacity for a high degree of work hardening during cutting—hence, act harder than normal during machining; (3) their microstructures, due to work hardening and the presence of precipitated carbides, are highly abrasive when in contact with conventional sintered-carbide cutting tools.

Tool-life tests clearly show how to machine the alloys to best advantage.

Feeds and speeds, the grade of carbide used, and the microstructure all are very critical. With the bucket alloys, a cutting speed of 35 to 125 fpm and a feed of 0.009 to 0.014 in. per revolution will afford acceptable tool life if the metal is in the solution-treated condition, and a cast-iron grade of tool is used.

Fig. 1 compares tool life and production rate—since the feed per revolution is constant—attainable with the bucket

materials, the turbine-disk alloy, stainless steels, and the high-strength alloy steel used for the turbine shaft. An attempt was made to prepare this chart showing each alloy to best advantage, that is, using the best tool material, the optimum feed, and the most machinable structure.

Until now, production requirements on turbine buckets have been small, and research into special cutting-tool materials has been without much incentive. Therefore, present data on machining represents the use of cutting tools designed for cutting cast iron and steel. A parallel could be drawn to a similar situation which existed about 15 years ago. When the tungsten carbide tools were first developed, they were highly successful in cutting cast iron and non-ferrous alloys, but failed almost instantly when steel cutting was attempted. Steel cutting grades of carbide were developed in direct response to a heavy demand. The cutting of steel was made possible when only small quantities of tantalum or titanium carbide were added to the original tungsten carbide.

Turbine-bucket alloys are almost totally unlike other engineering materials, and none of the present carbides seem entirely suited. Contrary to expectations, the cast-iron grade works out best, probably because of its higher hardness and abrasion resistance. Bucket alloys, cut with a continuous chip, exhibit an unusual tendency towards galling, seizure and cratering. This leads us to believe that some new, balanced composition of sintered carbide material containing a special anti-galling addition should be developed to meet these unusual requirements.

Dynamometer tests were made to determine basic machinability properties; machining tests established the relationships between tool life and speed and feed with various carbides and with different heat treatments. Two lathes were used, a 16-in. American Pacemaker, and a Monarch special test lathe. Both were equipped with variable-speed drives giving infinite cutting speeds up to 2500 rpm for the American, and 6000 rpm for the Monarch. Both had electric tachometers capable of measuring rpm within plus or minus one per cent. A two-component, mechanical-reading dynamometer was used in making the force measurements.

The first step in improving machining conditions on the jet engine alloys, especially the bucket materials, is to plan the sequence of manufacturing operations, if possible, so that they can have all the major rough machining operations performed with the alloy in the solution-treated form, leaving only a minimum of stock for finish grinding. The second step is to use the

(Turn to page 83, please)

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1st PLACE
NEVER TO TAKE
2nd PLACE

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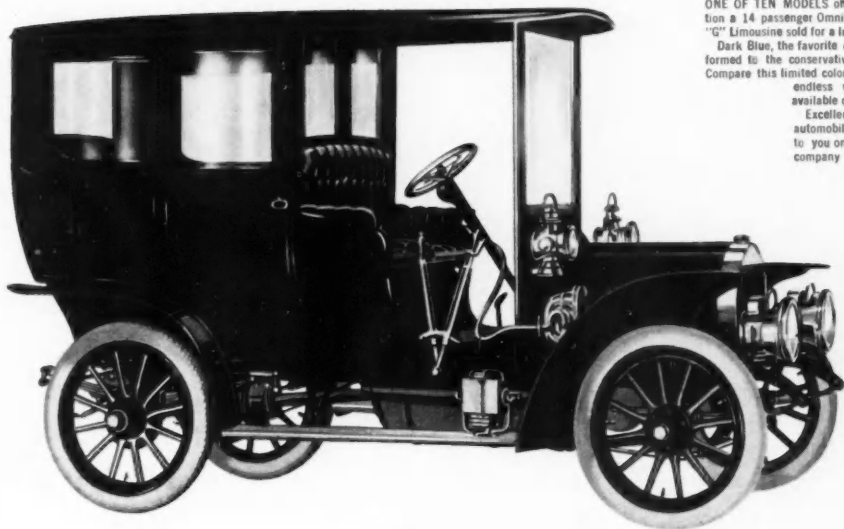
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Dark Blue, the favorite of three colors offered, conformed to the conservative lines of this early car. Compare this limited color selection with the almost endless variety of durable colors available on today's fine automobiles.

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Is it true what they say
about men who choose Blue?



IT IS SAID that he who prefers blue may be conservative by nature. He may be exceptionally cautious. He may be intellectual. Indeed, if the cool calmness of blue is attractive to a man, he may possess any or all of these traits.

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All colors . . . greens, reds, browns . . . fit into the logical pattern of every man's existence, reflecting his moods, his likes and dislikes. But man has an

instinctive fondness for color, because color (if we may say so) is fond of man. Color exists for man, complements his nature and contributes in overflowing measure to his enjoyment of life.

Thus, for example, while the automobile manufacturer selects his car colors with scientific seriousness, he must at the same time choose colors with the feeling and understanding that springs from the heart . . . for color and the emotional nature of man are closely interwoven realities.



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best carbide available, pending development of better tool materials. Finally, tool life will be satisfactory only if the best speeds and feeds are used. Four of the six alloys tested are austenitic or austenite-like, and despite their widely differing chemical compositions, they exhibit similar microstructures and physical properties. This family of alloys retains the same matrix structure over a wide temperature range, and therefore hardening can not be accomplished in the same manner as with carbon steels. Instead, the attainment of maximum hardness and strength requires a series of heat treatments and in some cases, mechanical working.

Solution treatment is the first step in hardening the bucket alloys. At a temperature of 2100 F or slightly higher, the carbides dissolve forming a single solid solution. This temperature is held long enough to attain uniformity throughout, then the parts are quenched in either air or water depending on the alloy. The solid solution remains after quenching but it is unstable and the carbides will again precipitate in time, hardening the alloy. Age hardening is accomplished quickly by reheating to about 1400 F and holding about 16 hr.

This family of alloys also work hardens to a high degree. Stress relieving is often used to remove the effects of hot working. The turbine-disk alloy is used in the work-hardened condition, and is seldom solution treated in this application.

This article is extracted from one chapter of a 162 page book recently published by Curtiss-Wright Corp., Wood-Ridge, N. J., for the Machinability Research Program sponsored by the U. S. Air Force. The committee that formulated the program and made this book possible consisted of the following individuals:

R. T. Hurley	Curtiss-Wright Corp.
H. Ernst	The Cincinnati Milling Machine Co.
D. Harder	Ford Motor Co.
G. Vinnerholm	Ford Motor Co.
R. M. Tirrell	Ford Motor Co.
A. E. Proctor	Ford Motor Co.
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J. T. O'Reilly	Ford Motor Co.
H. Tiffany	Ford Motor Co.
L. A. Tyner	Ford Motor Co.
V. Gorguse	Ford Motor Co.
M. Field	Metcut Research Associates
N. Zlatin	Metcut Research Associates
J. Kahles	University of Cincinnati
M. C. Shaw	Massachusetts Institute of Technology
S. D. Heron	Consulting Engineer

Cadillac Bumpers

(Continued from page 47)

welding along the joint. This is done in a specially designed, hand-operated fixture. As illustrated, the fixture contains two stations for accurately locating the two halves which are then clamped securely by means of cupped holding jaws. Welding is done by means of an argon gas shielded electrode. The joint is made up primarily by fusion of the parent metal, welding rod being applied only at several critical areas.

As mentioned earlier, the center bar is composed of two individual sections—an upper and lower stamping. The upper section is the more complicated since it requires not only deep draws but sharply defined outlines. It takes eight major operations—blanking, drawing, trimming, annealing, wiping the bottom flange, returning the bottom flange, restriking, and piercing. In this case it becomes necessary to anneal the work-hardened flange before wiping, and this is done in a Westinghouse induction heating unit, fitted with formed coils at the ends for heating the work-hardened areas.

Following these operations in the press shop, the bumper sections are routed to the electroplating department for buffing, polishing, and plating.

After plating, the front bumper is ready for final assembly into an integral unit. First operation is the sub-assembly of the upper and lower center section. This is done by cold riveting in a special assembly fixture. Then the various sections meet at the short mechanized assembly conveyor where the fastenings are prepared in a sequence of related steps. The assembly line, as illustrated, is manned by 14 operators.

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Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

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BIG in Efficient Production Plans



MIDLAND WELDING NUTS

Yes, Midland Welding Nuts play a big part in the assembly of metal parts. In dozens of plants they are helping materially to increase production—saving time and money—because they simplify the attachment of metal parts.

Effective in "BLIND SPOTS"



With Midland Welding Nuts anchored to parts in inaccessible positions, bolts are turned into these nuts without needing any device to hold the nut from turning.

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Air and Vacuum
POWER BRAKES



Air and
Electro-Pneumatic
DOOR CONTROLS



Production Planning

(Continued from page 46)

ough knowledge of engineering systems and specifications, complete familiarity with materials, tooling, shop and related functions. The organization, method, facilities and capacities of all plant activities must be common knowledge to the top planner if he is to be effective in tying together the numerous and complex threads that go into the manufacture of aircraft from time of conception to point of delivery to the customer.

Originally, the planning organization of the plant functioned under conventional lines wherein a separate tool planning department ordered all tools involved, leaving to the production planning department the ordering of all materials, parts, assemblies and installations. This method required that the two organizations closely coordinate and interrelate their various functions with each other even though geographically and organizationally separated. Inherent with such a system was the tendency to function in sequence with a resulting extension of time between engineering release thereby prolonging the interval between engineering and manufacturing. Also, it was necessary for each of the tool and production planners to spend the time involved in familiarizing himself with each drawing released, together with all its related requirements, before the job of ordering tooling and parts could be accomplished. This was an obvious duplication of effort resulting in added cost and time expenditures.

The advantages of combining these functions was apparent to the plant administration several years ago, and steps were undertaken accordingly shortly after pressures of World War II had subsided. Initially, the two departments were physically combined and located adjacent to the engineering department. Tool planners and production planners were assigned to the various planning groups as the first step in consolidating the efforts and knowledge of the two functions. Eventually, this close association and inter-exchange of knowledge and experience had progressed sufficiently for supervision to take the second step of the transition. This involved redistribution of work assignment which required a complete job of both tool and production planning from each of the planners, thereby eliminating the dual handling of each engineering release as formerly experienced.

The third and final major step required that key planners maintain constant coordination with the engineering organization so that engineering information could be converted into basic planning records during the process of design preparation. (Turn to page 86, please)

Reprints from this or other Logbook pages are available for your files. Request them from our Redwood City, California office

Unusual Syntech* Oil Seal designed to improve performance of shock absorbers

The most widely used type of automotive shock absorbers incorporate a unique oil seal for retaining hydraulic fluids which are subjected to widely varied pressures. In these applications the seals must perform extremely efficiently on a rapidly accelerating and reciprocating shaft. Obviously, failure of the seals on an application of this kind means complete failure of the entire unit.



Fig. 1
Syntech Oil Seal, cross section.

The sectional drawing (Fig. 2) shows an example of the type of construction being commonly used. In this case the piston shaft (A) connects to the frame and transmits the road shock which is dampened by a double-acting piston-type hydraulic system. The National Syntech Oil Seal is located at (B) on the main shaft and an Arrowhead "O" Ring (C) forms a seal between the piston and the cylinder.

As can be seen in the close-up section (Fig. 1), the Syntech Oil Seal is simply a molded rubber ring having three sealing lips molded into the inner surface. This unique shape enables the seal to withstand the sharp pressures without

binding or restricting the piston shaft movement. The triple lip provides extremely efficient sealing around the re-

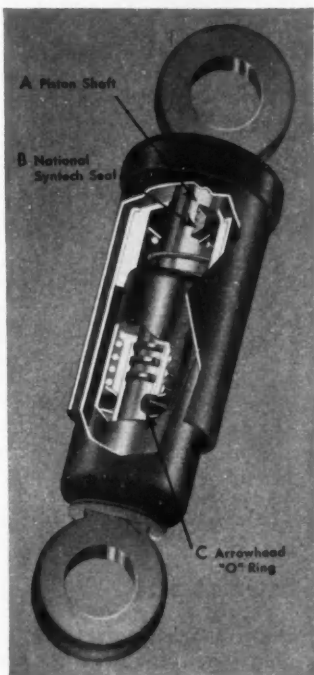


Fig. 2
Typical shock absorber design.

ciprocating piston shaft while the outer lip acts as a dirt excluder. The spring-loaded clamping washer partially com-

pensates for wear.

The development of new sealing-member compounds has considerably broadened the use of compact unitary oil seals on reciprocating shafts. Many National Syntech designs have been employed on such applications. Sectional drawings of two are shown in Fig. 3. Limited contact sealing lips provide zero leakage performance with the minimum of drag and, because these units are molded, the design of shape and thickness is almost limitless.

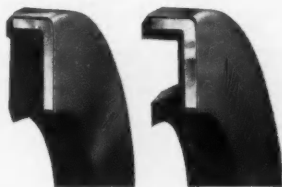


Fig. 3
National 340,000 Series Syntech Oil Seal, pressure type shown on left.

National Engineers will be glad to cooperate with you on your sealing problems. Perhaps the solution may be found in the adoption of a standard design, in which case important savings may be achieved. However, if special designs prove necessary our research and engineering departments are at your service.

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DALLAS, TEXAS	30 1/2 Highland Park Village, Justin 8-8453	REDWOOD CITY, CALIF.	Broadway and National, Emerson 6-3861
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DOWNNEY (Los Angeles Co.), CALIF.	11634 Parton Rd., Topas 2-8166	SYRACUSE, N. Y.	P. O. Box 1224, Baldwinsville 662
	WICHITA, KANSAS		504 East Third Street, Wichita 2-6971

tory to release to the manufacturing department within a matter of hours, and not to exceed three days after final release from engineering.

Close association between planners, engineers and tool engineers has proved mutually beneficial in that plant facilities and equipment are considered during initial design states. Planners are gaining constantly in technical knowledge to the advantage of a better job of planning. Engineers are considerably more conversant with shop and general manufacturing problems to the extent that their drawings reflect to

the benefit of production technique and efficiency without sacrificing quality and cost. Planning is now able to function concurrently with engineering rather than consecutively. As a result, the interval between engineering release and planning release to manufacturing and related functions is appreciably reduced. In turn, this permits the saving of invaluable time preliminary to manufacturing start and consequently earlier delivery of aircraft.

Under separate operation, it was common for tool planners (in not knowing the other planning func-

tions) to provide tooling, for example, that would successfully and economically build the assembly involved, but through lack of knowledge of the production planner's problems, would not allow for finish process requirements. In reverse, the production planner's assembly breakdown might not be advantageous to tooling and parts relationship. Consolidation has eliminated such problems of coordination now that the planners are qualified to execute a dual function.

The advantage of a single source of planning contact for both engineers and shop personnel has considerably simplified problems of coordination. Combined operation permits dating of tooling requirements to coincide in exact timing with parts manufacture. The previous method, under separate organization, scheduled tooling fabrication to "block" position or assembly requirements which did not necessarily date in accordance with parts fabrication release, with resulting overlap or interval between tooling availability and start of parts manufacturing schedules. Certain overhead costs and the dual supervision formerly required has been eliminated as a result of combined operation.

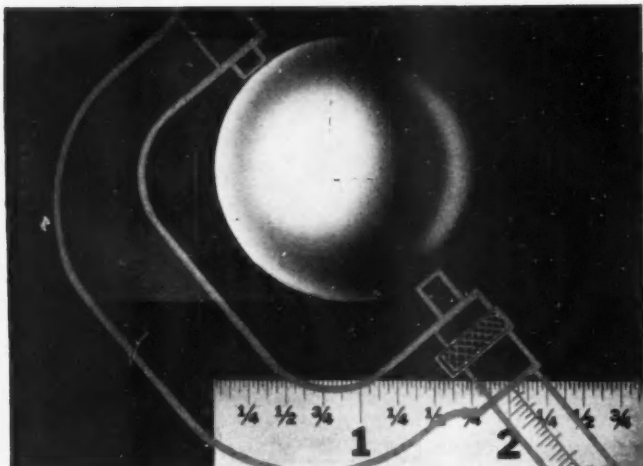
Included with production planning, and interrelated organizationally to best advantage of coordinated activity, are the experimental planning and tool design departments, together with a staff of tool engineers who carry out the function of establishing and maintaining the various programs relative to designed tools.

Supporting functions to, and a part of, the planning organization are: the blueprint control section which maintains a complete filing, disbursement and sub-filing section to accommodate all manufacturing, materiel and tooling needs; the reproduction group which handles the mechanical duplication of all order and delivery forms; and the planning, tabulating department, which controls releases, supplies statistics, and performs all clerical and filing functions necessary to smooth and complete operation. Typing in the planning department is conspicuous by its total absence in that reproduction is accomplished direct from Multigraph and Oxalid masters as prepared in pencil by the planners.

The successful functioning of the planning department under this concept of operation has proved its practicability with the result that the previously indicated economies and operating efficiencies are now a matter of fact.

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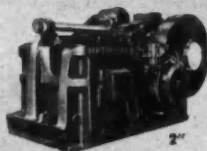
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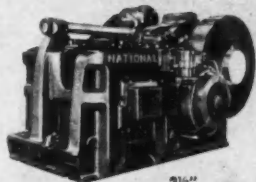
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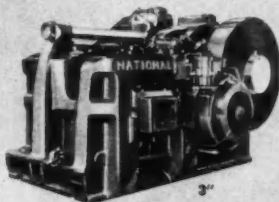
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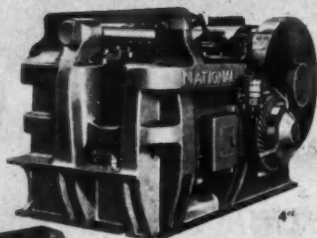
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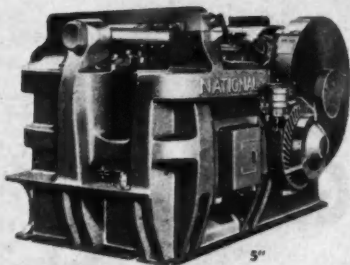
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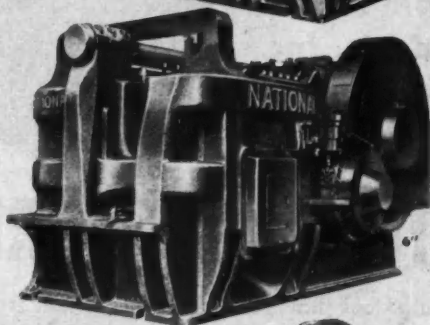
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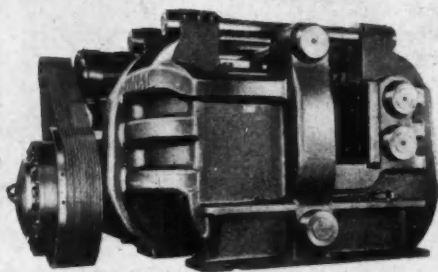
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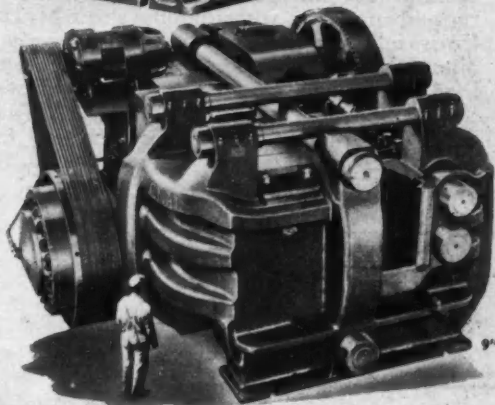
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6"



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9"



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Operations on Chrysler Torque Converter

(Continued from page 42)

tion of sub-assemblies consisting of the torus ring and blades for the impeller and turbine. This is done by spot welding in special multi-spot resistance welding machines designed for the operation. The impeller requires 37 blades held to the torus ring with three rows of spot welds for a total of 111 spots. The turbine has 35 blades held to the torus ring with two rows of spot welds for a total of 70 welds.

These sub-assemblies then are trans-

ported on a monorail conveyor line to the brazing department on the second floor. Here they are assembled into the corresponding housings and the edges of the blades are coated with a special brazing paste which is brushed on by hand, care being taken to coat only certain specified areas. This is done to control the areas to be brazed, leaving certain portions free from brazing.

Following this hand operation, the assembly is pressed together firmly in

an arbor press and is ready for the brazing furnace. Just before the work enters the furnace, the operator at the loading station paints the outer edge of the housing with an aluminum paint to prevent the brazing compound from sticking. The assemblies then are mounted on special trays, four to a tray, and loaded into the hydrogen brazing furnace. At the present time there are two furnaces in operation. Each one is about 125 ft long, accurately held by recording instrument control to a temperature of 2050 F. The brazing cycle takes about 95 minutes.

After brazing the turbine and impeller, assemblies are returned to the machine shop for final machining. All of the machining on these parts is done in double-end precision-boring type equipment, fitted with single-point cemented-carbide tools.

Meanwhile, the remaining parts are machined and made ready for final assembly. In this connection it is of interest that the two aluminum stators are accurately balanced before acceptance for assembly.

The complete assembly of the torque converter then is prepared and made ready for sealing. This is done by seam welding in the special machine, illustrated here, its principal feature being the automatic submerged arc process welding head with which the weld is prepared under a heavy flux. The result is a sound and dense weld, requiring no finishing save for removal of the crusted flux on the surface.

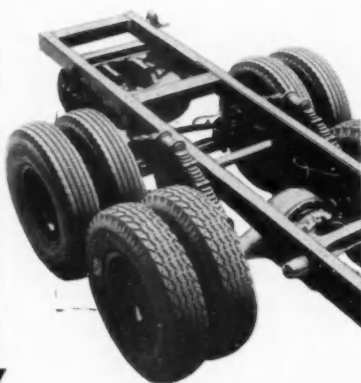
Final operation before delivery to the assembly plant is the testing of the assembly in a test machine. For this purpose the unit is filled with the special fluid, then put through a cycle for checking the operation of the pump and valve, and finally for torque readings.

Mention was made earlier of an electronic gaging machine used for grading the hub sleeve cams. The unit installed at Chrysler operates at a frequency of 30-mc, utilizes a gaging head which has no magnets, coils, or frictional parts. It inspects the part for 16 dimensions. If the dimensions are all OK the electronic brain control circuit is synchronized with the mechanical segregator allowing the part to slide down the OK chute.

If any of the characteristics are not up to standard the electronic brain automatically locks the bad answer and holds it until the part is ready to be rejected. Accuracy of the instrument is said to be plus or minus 0.000010 in. In addition to the uncanny accuracy of the gaging head and gaging circuit, special attention has been given to mechanical transfer and the stability of the gaging circuit. Despite its microscopic accuracy, the machine can be readily adjusted within a relatively short set-up time.

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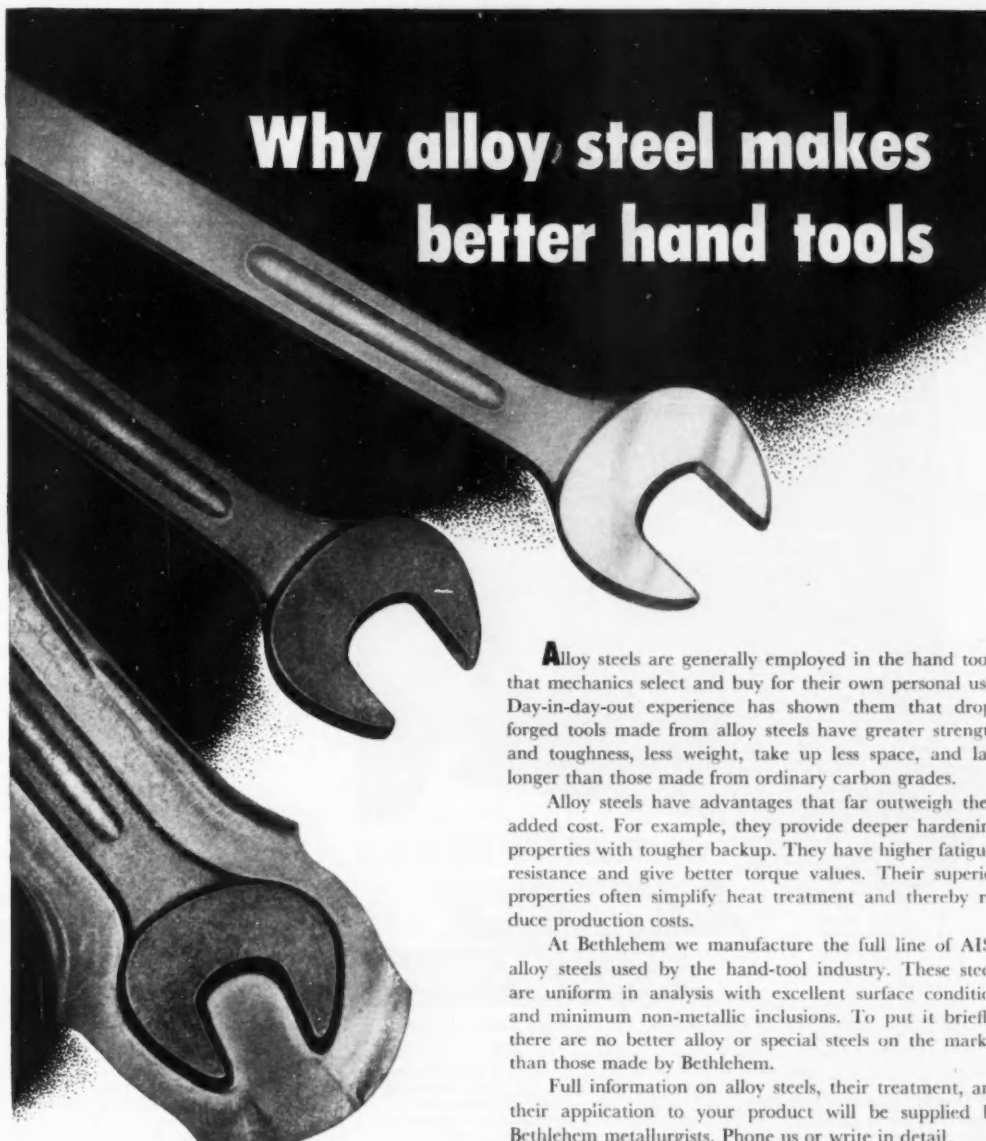
Rolling stock that isn't supported by "underpinnings" rugged enough to withstand the strain of extra-heavy loads, on extra-long hauls, over extra-rough roads often comes to a sudden standstill. To assure better load distribution, longer tire wear and fewer breakdowns specially designed TUTHILL Alloy Steel SPRINGS are included in specifications for buses, power shovels, 6-wheel conversions or third-axle heavy-duty jobs.

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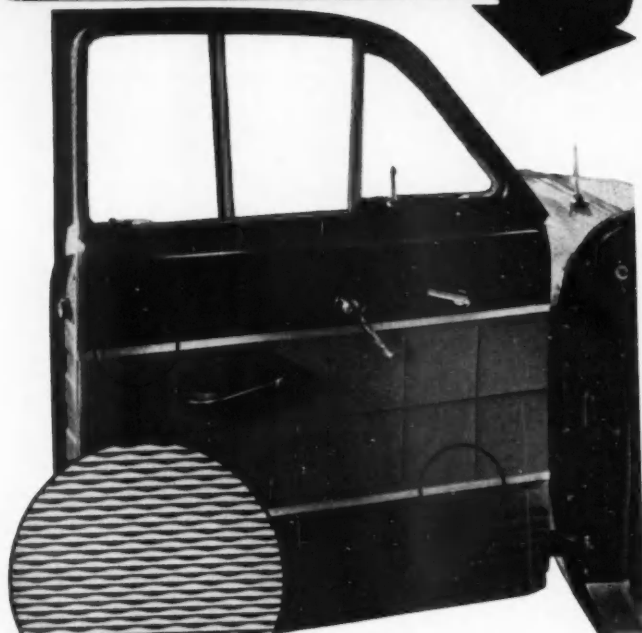
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OF COMING SHOWS AND MEETINGS

Conventions and Meetings

- Salone Internazionale Dell'Automobile, Turin, ItalyApr. 4-15
- Amer. Soc. Lubricating Engrs., Phila.Apr. 16-18
- SAE National Aeronautic and Aircraft Engine Display, Hotel Statler, N.Y.C.Apr. 16-18
- Amer. Mgt. Assoc., Nat'l Packaging Expos., Atlantic CityApr. 17-20
- 1951 Metal Powder Show and 7th Annual Meeting of Metal Powder Assn., Cleveland, OhioApr. 25-26
- Chamber of Commerce Annual Mtg., Washington, D. C.Apr. 30-May 2
- Materials Handling Conference, ChicagoApr. 30-May 4
- A.E.R.A. Convention, ChicagoMay 7-9
- Society for Experimental Stress Analysis, National Bureau of Standards, Wardman Park Hotel, Washington, D. C.May 16, 17, 18
- Amer. Society for Quality Control, ClevelandMay 23-24
- Third World Petroleum Congress, The Hague, Scheveningen, HollandMay 28-June 6
- SAE National Summer Meeting, French Lick, Ind.June 3-8
- American Gear Manufacturers Assn. (Annual Meeting), Hot Springs, Va.June 4-6
- American Society of Mechanical Engineers semi-annual meeting, Toronto, CanadaJune 11-15
- American Society for Testing Mat'l's Annual Meeting, Atlantic City, N. J.June 18-22
- SAE National West Coast Meeting, Seattle, Wash.Aug. 13-15
- First European Machine Tool Exhibition, ParisSept. 1-10
- SAE Tractor and Production Forum, Milwaukee, Wis.Sept. 10-13
- Sixth National Instrument Conference and Exhibit, Houston, Texas Sept. 10-14
- American Society of Mechanical Engineers (fall meeting) Minneapolis, Minn.Sept. 25-28
- Nat'l Metal Trades Assn., Chicago, Ill.Sept. 26-28
- SAE National Aeronautic, Production Forum, And Display, Biltmore Hotel, Los Angeles, Calif.Oct. 3-6
- SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill.Oct. 29-30
- SAE National Transportation Meeting, Knickerbocker Hotel, Chicago, Ill.Oct. 29-31
- SAE National Fuels and Lubricants Meeting, Drake Hotel, Chicago Ill.Oct. 31-Nov. 1

AUTOMOTIVE INDUSTRIES, April 1, 1951



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The Lashograph

(Continued from page 51)

calibration is accomplished in the same manner.

The vibration which made readings at high speeds difficult with the Lashometer is reduced in the Lashograph by the addition of the plunger return spring. This spring not only steadies the cam action, but also helps to overcome friction within the plunger bushing, assuring greater accuracy in the instrument. Another feature of the Lashograph is the shoulder that is provided

at the base of the plunger to remove the load from the cam when the valve is opened. Only enough space is provided between the shoulder and the plunger bushing, at B, to account for variations in valve lash, when the valve is closed.

The point marked C is the zero setting on the scale. It is set with the tappet on the cam base circle, with the engine cold. Calibration is made by inserting feeler gages between the valve

tip and the rocker arm, which turns the mirror, deflecting the light beam to C'. The distance between C and C', then, is the amount of valve lash originally provided. It is possible to check the clearance with a feeler gage while the engine is running.

With the engine in operation, expansion or contraction in the valve train reduces or increases the clearance between the push rod ends, deflecting the cam and mirror assembly from its original position. This causes the reflected light beam to be similarly deflected, so that, at intervals, its position may be observed on a graduated scale on the screen; the amount of change being a function of the change in valve clearance.

Of course, the light beam is also deflected rapidly when the valve opens, but, since it is closed for more than 180 deg of camshaft rotation, the light beam is more clearly defined in its closed position than at other points on the scale. Consequently, the variations from its initial position are easy to determine. Before taking any readings, however, it is necessary to provide the valve mechanism with sufficient clearance to insure complete closure of the valve under all operating conditions. The instrument is set to read zero with this clearance, and subsequent variations from zero indicate changes in valve lash.

Strain-Gage Method of Determining the Running Lash of L-Head and Overhead-Valve Engines

By A. E. Cleveland

Ford Motor Co.

A STRAIN-GAGE lashometer, Fig 2, to study operating valve lash variations, consists of a two-prong fork, fitting between the valve and lifter. The base of this fork is pivoted in an anchor in such a manner as to permit the free end to travel up and down with the valve. The spring load of the fork being much lower than that of the valve (Turn to page 94, please)

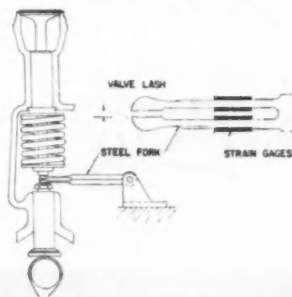
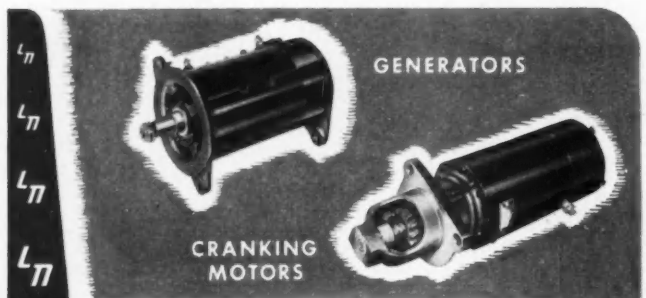


Fig. 2—This working diagram of the strain-gage lashometer shows the location of the steel fork between the valve stem and the lifter. Strain gages are located on the top and bottom of each fork prong.



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CRANKING MOTORS from ½ H.P. to 27 H.P. Illustrated is motor for 12 volt and 12-24 volt systems.

VOLTAGE REGULATORS of rugged construction for heavy duty service.

SWITCHES, hand and magnetic, for standard 12 volt systems and for 12-24 volt series parallel systems.

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**Another new development using
B. F. Goodrich Chemical Company raw materials**



*Hycar seal made by Parker, Stearns & Co., Brooklyn, N. Y.
Photo courtesy of Republic Aviation Corp., Farmingdale, Long Island, N. Y.*

safest seal

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THAT'S the greenhouse of a Thunderjet, ready to slip into position. When it does it will stay sealed air-tight, even at supersonic speeds and high pressures.

You wouldn't know that dozens of seals had been tried and found wanting until Hycar was used for the job. These inflatable seals of various materials would crease and fold in the corners or pull out of the channel. Some actually became soft under high temperatures. Some "ballooned" into the cockpit.

All that happened before a Hycar OR-25 compound was used. The seal is a U-shaped tube with a short intake tube connected to the Thunderjet's compression pumps for fast inflation

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Hycar OR-25 is just one of a wide range of highly useful rubber compounds. They've helped solve many "tough" problems, because they are so versatile. For Hycar has advantages that exactly meet many civilian and defense needs.

Hycar has outstanding resistance to oil, gas and many chemicals. It resists heat and cold, weather and wear, abrasion and more hard-to-meet conditions. It may be just what you need to improve or develop a product.

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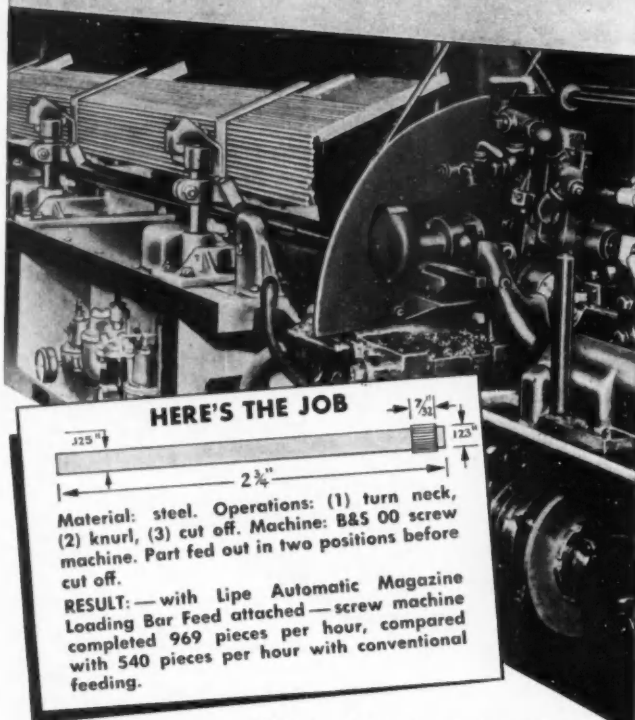
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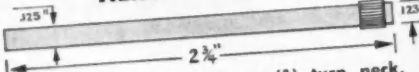
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spring, the prongs of the fork close as the cam takes up the valve lash and remain closed until the valve is seated. When the lifter follows the cam into the unloaded base circle the fork returns to its normal open position.

As the valve expands or contracts relative to the cylinder block, the take-up distance between the prongs of the fork becomes greater or less, corresponding to the lash. This takeup distance is converted into elastic strain and transmitted to four strain gages mounted, one each, on the tension and on the compression side of each of two prongs of the lashometer fork.

These four strain gages, Fig. 3, wired in a conventional bridge circuit, provide the voltage of unbalance of the bridge to activate a Brush oscillograph and amplifier recording system. The amplitude of the oscillograph trace is therefore directly proportional to the

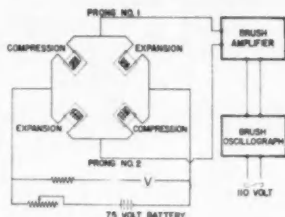


Fig. 3—The four strain gages are wired in a conventional bridge circuit and activate a Brush oscillograph and amplifier recording system.

bridge unbalance which in turn is proportional to the valve lash.

Temperature compensation, most important in any strain gage measurement taken over a wide range of engine operating conditions, is automatically provided by the alternate tension and compression location of the strain gages on top and bottom of the fork prongs and the balance of the bridge circuit.

Observations from multiple lashometers have been made possible by a special circuit and switching arrangement and have proved very useful in saving the time of shifting the instrumentation from one valve to another.

Materials of Military Motorized Equipment

(Continued from page 50)

tanks and other combat vehicles requires combinations of physical properties, not required normally for constructional uses. The three major properties are soundness, hardness and toughness. As a result of many years of research, development and testing, a definite correlation between these properties and ballistic performance against conventional armor piercing ammunition has been established. It is (Turn to page 96, please)

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WITH higher compression, greater heat and increased power, today's engines sometimes show a tendency to burn more oil because of block distortion.

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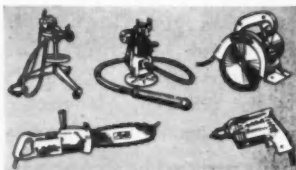
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expected that the tremendous burden, expense and delays associated with ballistic testing during World War II can be greatly reduced if not eliminated in current and future production. To obtain the necessary soundness and high hardness with adequate toughness, as determined by the low temperature Charpy impact test, presents no serious or unusual technical problems to steel producers, fabricators, and foundries accustomed to supplying high quality, heat treated steel plate or castings, except where thickness and mass are considerably greater than found in quenched and tempered parts for commercial use. However, steel mills and foundries working with Watertown Arsenal have been able to obtain combinations of hardness and toughness in sections six in. and over in thickness.

During World War II steel armor was welded with austenitic electrodes containing approximately eight per cent nickel and 18 per cent chromium. Since then, Watertown Arsenal has provided ferritic electrodes suitable for welding armor and high-strength constructional steels. This research and the developmental work of industry have resulted in the availability of ferritic electrodes and much of the technical information necessary to produce strong, tough welds in armor.

At this time we are keenly aware of the problems facing producers and users of heat treatable steels because of the necessity for reducing to the absolute practicable minimum the alloys used to obtain high strength, hardness, and other properties essential to modern military and civilian equipment.

Other ferrous metals, including malleable and pearlitic malleable iron, are used in Ordnance. We expect that the newer nodular graphitic cast iron also will find many applications. It already has found some uses in ammunition.

Heat- and erosion-resistant materials are becoming increasingly important to our success in providing new and improved weapons. Thus far the most promising materials for such applications contain very high percentages of critical alloys and therefore, it is apparent that the development and evaluation of alternate materials must be undertaken. Before real progress can be made in this field, better laboratory methods of evaluation must be developed to provide a means of rapidly screening prospective materials. The use of porcelain-coated mild steel to replace stainless steel in manifolds and mufflers of combat vehicle engines is being investigated as one means of conserving critical alloys.

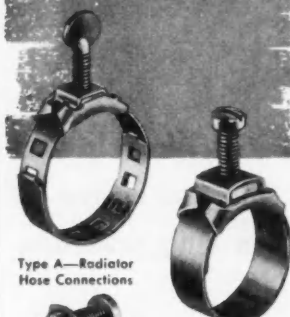
Although the tonnage of non-ferrous metals used in Ordnance is small when compared with steel, these materials play a vital part, particularly in artillery fire control instruments and ammunition as well as in the conventional applications in motorized and mobile equipment.

(Turn to page 98, please)

WITTEK

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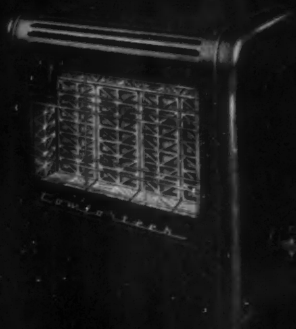
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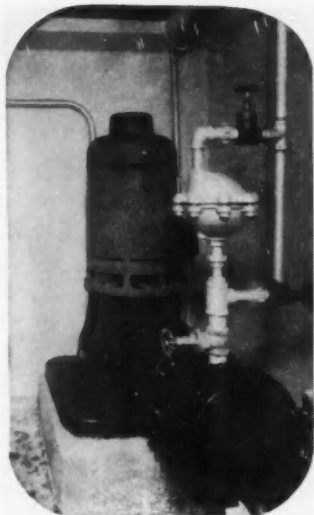
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6. Saves cost of frequent descaling and desludging
7. Drag-out costs are less because of low original cost of solution
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9. Cuts cost of rejects caused by rusting before painting

FREE ... illustrated folder describes the Oakite *CrysCoat* Process for use in before-paint-treatment of steel, aluminum sheet and castings, zinc die castings and galvanized surfaces. If you are engaged in the fabrication of civilian goods or the speedy production of defense orders—send for Folder F7642.

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Traditionally, cartridge brass, 70 per cent copper and 30 per cent zinc, has been used in larger quantities than all other non-ferrous metals. Cartridge cases ranging from cal. .30 to 120 mm are required by the million. The diminishing supply of copper and zinc and technical problems arising in connection with weapons of new design make it necessary to turn more and more to steel for cartridge cases which involves numerous problems.

Aluminum alloys, because of their potential criticalness during a large military production program, generally are used in Ordnance equipment only where they provide a great advantage over less critical materials.

The constant demand for improvement in performance with weight reduction in all classes of Ordnance equipment has led us to consider all kinds of constructional materials which provide a high strength-density ratio. Because of the natural limitation on availability of aluminum, we turn to magnesium. While lack of definite knowledge of the possibilities and limitations of this material and limited experience in its fabrication undoubtedly have been the chief deterrents; poor resistance to abrasion, heat and corrosion also have been real obstacles to Ordnance design. However, the practically unlimited availability of raw material and the steady progress in development of alloys with better physical properties, during the past four years, has caused the Ordnance Corps to continue the search for solutions to the various technical problems. In fact, Frankford Arsenal has developed a surface treatment which provides protection against corrosion, together with excellent resistance to abrasion and the ability to withstand heat.

Titanium and titanium alloys should not be omitted from any current discussion of constructional materials of high strength-density ratio. It is conceivable that titanium alloys can be substituted thickness for thickness for steel armor, reducing armor weight by about 40 per cent. Similar weight savings in some structural components of military vehicles also are anticipated.

USAF to Open Government-Owned Chevrolet Plant in Buffalo

The Government-owned plant in Buffalo, N. Y., where GM's Chevrolet Motor Division made thousands of aircraft engines during World War II will be opened "just as soon as possible" for the production of jet-plane power plants, the U. S. Air Force has announced. The Munitions Board directed the General Services Administration of turn the plant over to the Air Force for reopening. This paved the way for Chevrolet to resume activities in the factory. It is expected to take some time, however, before operations in the plant can be resumed.



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A CLEVELAND TAPPER set up on a munitions job, tapping a 1 15/32", 16-pitch Butress thread in SAE 4143 steel tubing hardened to 35 to 37 Rockwell.

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Standard tools



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Special drawings



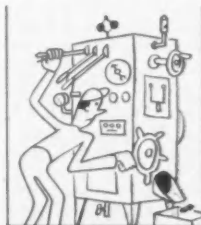
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Special stock



Special tools



Special production



Special bookkeeping



Special costs (higher)



Special profits (lower)



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Flat Head Socket Cap Screw



Self-Locking Knurled Point Socket Set Screw



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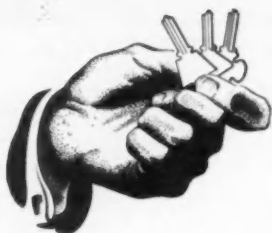
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Fighting Vehicles in Korea

(Continued from page 36)

six by six carry personnel, ammunition, rations, and other supplies. The jeep is used also for front line reconnaissance, and with machine guns mounted on it as a combat reconnaissance vehicle.

Some special purpose vehicles used by the Armed Forces Engineer Signal Corps and Ordnance are:

1. The ambulance, a three-quarter ton chassis with a specially built van, can carry as many as five patients. It is principally a road vehicle in that it cannot maneuver through the paddly fields and hills like the GP vehicles.

2. Signal corps special purpose vans, with 2½ ton chassis, have special bodies and equipment mounted on rear. These are used by signal line men and for setting up radio relay stations.

3. Engineer vehicles of a variety of makes, including the Brockway Bridge-bullery, are the largest Army road vehicles. The Brockway is used for transporting and then constructing giant bridges on short notice.

4. The Weasel, a tracked 2½ ton vehicle for personnel and cargo used to cross swamps, mud and rice paddies.

5. The bus, a special van mounted on a 2½ ton chassis and manufactured by Japanese. These buses are used in headquarters areas and as ambulances. Some are constructed with a spare pair of flanged wheels which can be raised or lowered. When lowered the bus moves along railroad tracks, avoiding the frequently rough roads.

Major R. S. Stanley of Columbus, Ga., says the vehicles being used by the Army have proved themselves in a tough war and if improvements were possible he would suggest larger, broader front springs, stronger shock absorber linkage, and some method for cushioning the shock when the base of the radiator strikes the frame, which causes radiator leakage.

To each Army unit are assigned a certain number of organic vehicles supplemented by the vehicles of the transportation corps. The trucks do all the work from the railheads or airfields to the front lines.

To keep the vehicles serviceable, the Army has instituted a policy of frequent checks and overhauls, to hold the damage caused by poor road conditions to a minimum. Each vehicle goes through three types of periodic check and overhaul. These are:

1. Weekly service conducted by the driver who cleans his vehicle, tightens bolts and screws, and checks lubrication.

2. Monthly checks by Ordnance or Motor Maintenance personnel including lubricant changing, oil change and checking the engine and spark plugs.

3. The semi-annual check which is the complete overhaul of the vehicle by

a rear echelon maintenance unit. Here the vehicle is given a complete inspection and tune-up, including wheel pulling to inspect the wheel bearings.

To supply a maintenance net which keeps the vehicles of the Army in good repair, the Ordnance Department maintains an ordnance company with each division, one company with each corps and an ordnance unit with the Rear Area Logistical Command.

Forward Ordnance units are equipped to perform all but major repair duties. They keep engines in trim or replace them, and can place a vehicle back in operation even after an accident which has destroyed a good part of the engine or transmission. For major repair, such as work on a body which has been bent out of shape, Ordnance calls on its rear echelon units in permanent shops to do the work.

But the frontline mobile repair shops do the bulk of the work. They replace engines, grind valves and repair radiators. These shops have no hydraulic lifts, but improvise with the use of cranes or the booms of wreckers.

Meanwhile, as the weather has alternated in Korea between freezing sleet and driving rains that made sludge of the roads, the Army of the United Nations has continued moving northward on the wheels of its World War II vehicles.

White Mustang

(Continued from page 37)

tion improves detonation control and makes possible a 6.75 to one compression ratio. Piston displacement is 386 cu. in. Improved intake ports, a metered intake manifold, and high-lift (0.400 in.) intake valves contribute to the engine's efficiency. Exhaust valve lift is 0.381 in. Temperature of the incoming mixture is controlled by a water jacket on the intake manifold.

Exhaust valves are sodium cooled, and valve lifters are hydraulic type. The cam ground, four ring, aluminum pistons have a Ni-Resist iron insert cast in as a carrier for the top compression ring. This construction resists corrosion and wear of the ring groove.

Exhaust manifolds are made in two separate sections, one for the front three cylinders, and another for the rear three cylinders. Each section has ample cross-sectional area and outlet area to keep back pressure to a minimum. There is a separate exhaust pipe from each section to the muffler.

Ignition timing at the distributor is fully controlled by pressure drop at the carburetor. No centrifugal weights are used.

The Mustang engine is optional in any White tractor or truck. Production has already been started, and a number are in service in various parts of the country.

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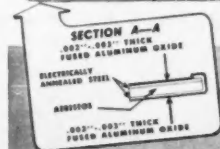
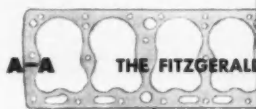
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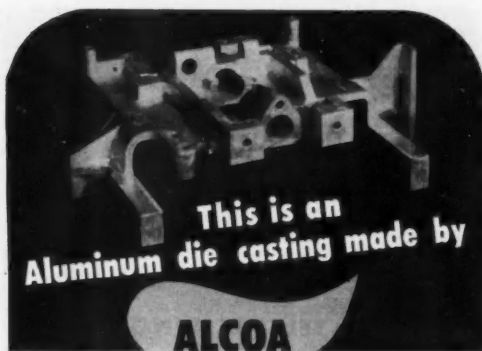
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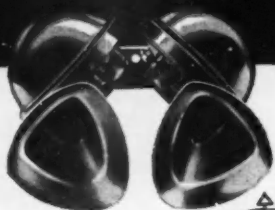
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1 3/4 in.

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New Convair Transport

(Continued from page 53)

climb faster and to higher altitudes than the 240. The extra wing area also increases fuel capacity 150 gallons. Integral fuel tanks carry 1700 gallons.

While the fuselage of the 340 will be the same diameter as that of the 240 (nine ft five in.), length of the 340 is 79 ft two in., an increase of 54 in. A 38-in. cylindrical fuselage section is added aft of the wing and a 16-in. section forward of the wing. This extra space can be utilized for installation of four passenger seats, making passenger capacity 44, or it can be used for cargo purposes. The extra length also allows more latitude in loading because of a greater center-of-gravity range.

Two 2400-hp Pratt & Whitney CB series engines improve performance because of allowable higher cruising powers. The CB engines develop take-off power to much higher altitudes. At the same weight and power settings, and for maximum range condition, the 340 will cruise approximately eight miles an hour faster than the 240.

Pressurization and air-conditioning systems will include a number of improvements. A new type engine-driven supercharger with two-speed operation will be installed. Air conditioning during ground operation will be possible because of a hydraulic clutch which automatically compensates for reduced engine speeds. New air conditioning equipment will be installed to match the performance of the new supercharger.

A completely new electrical system will be installed in the 340. The basic system will incorporate overvoltage and generator feeder-fault protection. Control and power components will be separated into different units to simplify circuitry and to increase safety of the system.

An electrical compartment is provided aft of the co-pilot's station for installation of major accessories. This central station will permit convenient servicing and maintenance for the majority of electrical units.

The 340 landing gear is longer than that installed on the 240, and is completely new. The main strut is 2 1/2 in. longer. Low pressure, Type III tires, either in 11.00-16 or 12.50-16 sizes have been selected to reduce tire pressures.

Both the strut and wheels are being designed for installation of a Decelostat unit to extend life of tires by preventing skidding. Tread of the main gear is 25 ft.

The 340 is being designed so that turboprop engines can be installed with a minimum of modification as soon as gas turbine engines are available for commercial operation. Structurally, the 340 will be capable of flying at much higher speeds than will be possible in normal operation with the piston engines.

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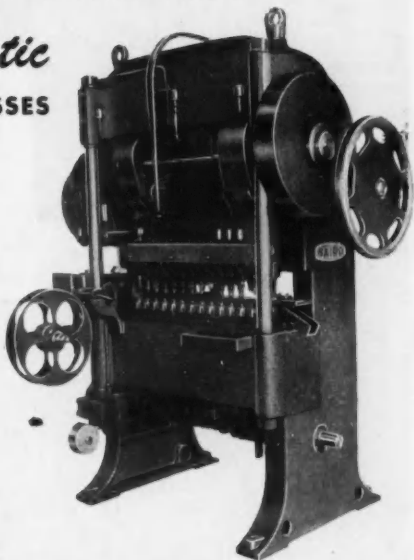
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MULTIPLE TRANSFER PRESSES

Simply stated, this press combines, in a single cycle, operations that might otherwise require several smaller machines with an operator for each one.

There are so many varied tooling possibilities that it is impossible to enumerate them here. In ordinary operations the press automatically feeds coil stock for piercing, lettering, embossing, etc., then cuts the blank, places it in transfer fingers, moves it along to several other tool stations and ejects the finished piece. In addition, preformed material may be fed from the opposite end of press for many other operations . . . all completely automatic. A full set of tools (composed of punch and die blocks, their punches and dies, transfer slide and fingers) may be removed as a single unit . . . and a different set inserted, and in some instances without disturbing any adjustment . . . in a comparatively short time.

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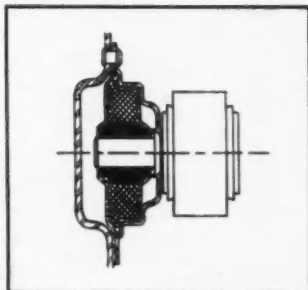
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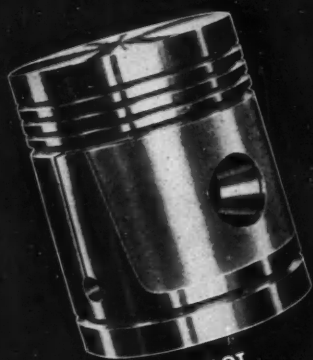
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